

# **EXHIBIT F**

UNITED STATES DISTRICT COURT  
DISTRICT OF MONTANA  
MISSOULA DIVISION

PAUL PRICE, JOHN PREBIL and MARGERY  
PREBIL, on behalf of themselves and all others  
similarly situated,

Plaintiffs,

vs.

W.R. GRACE & COMPANY (a Delaware  
corporation); W.R. GRACE & COMPANY-CONN  
(a Connecticut corporation); W.R. GRACE & CO.,  
a/k/a GRACE, an association of business entities;  
SEALED AIR CORPORATION (a Delaware  
corporation),

Defendants.

No. CV 00-71-M-DWM

AFFIDAVIT OF HENRY A. ANDERSON,  
M.D. IN SUPPORT OF PLAINTIFFS'  
APPLICATION FOR PRELIMINARY  
INJUNCTION AND EMERGENCY  
NOTICE TO CLASS MEMBERS

PLAINTIFF'S  
EXHIBIT

25

MDL 1336

AFFIDAVIT OF HENRY A. ANDERSON, M.D. IN SUPPORT OF  
PLAINTIFFS' APPLICATION FOR PRELIMINARY INJUNCTION  
AND EMERGENCY NOTICE TO CLASS MEMBERS - 1

STATE OF WISCONSIN )

COUNTY OF DANE )

HENRY A. ANDERSON, M.D., being duly sworn, deposes and says:

1. I am a physician and epidemiologist, and I am currently Chief, Section of Environmental and Chronic Disease Epidemiology with the Wisconsin Division of Health in Madison, Wisconsin. I am also an Adjunct Associate Professor with the University of Wisconsin, with appointments in the Department of Preventive Medicine with the University of Wisconsin Medical School and an appointment with the Institute for Environmental Studies. I presently hold the position of State School Asbestos Coordinator for the state of Wisconsin.

2. In 1968, I graduated from Stanford University with a B.A. Degree and I received my M.D. Degree from the University of Wisconsin Medical School in Madison in 1972. After completing a one-year straight medical internship in the Department of Medicine, Montefiore Hospital and Medical Center, Bronx, New York, I became a resident in occupational medicine at the Environmental Sciences Laboratory, Mt. Sinai School of Medicine in New York City. After I completed my residency in 1976, I remained at the Mt. Sinai School of Medicine until 1980, where I participated in asbestos-related clinical research. Under the direction of Dr. Irving J. Selikoff, numerous epidemiological studies on the health effects of asbestos exposure were undertaken at the time I was present at the Mt. Sinai School of Medicine. Before leaving the Mt. Sinai School of Medicine as Assistant Professor of Community Medicine in June 1980, I examined over eight hundred persons who were suspected to have asbestos-associated diseases and reviewed the chest x-rays of several thousand others. In order to better facilitate my participation in clinical studies of asbestos workers, I became a "B" reader for the interpretation of x-rays for pneumoconiosis.

3. During my tenure with the Environmental Sciences Laboratory at the Mt. Sinai School of Medicine, I developed a particular interest in the study of asbestos-related disease among family members of asbestos workers. In the early 1970's, I initiated, and became the principal investigator of a study of family members of asbestos factory workers in Patterson, New Jersey who worked in that facility from 1941 to 1945. There were two purposes of the study. The first was to

see whether or not the family members had the stigmata of asbestosis and the second was to

2           4.       The study found that, of those family members who were examined, thirty-five  
3 percent of them demonstrated asbestos-associated radiographic abnormalities. Furthermore, of the  
4 family members of persons who worked at the asbestos facility between 1941 and 1945, three of  
5 these family members died of mesothelioma, a virulent cancer of the pleura and peritoneum that is  
6 caused by asbestos. The study concluded that family members of asbestos workers, who would have  
7 only been exposed indirectly to asbestos, were at a greatly increased risk for the development of  
8 asbestos-associated diseases. These family members contracted disease not by occupational  
9 exposure to asbestos, but as a result of the result of the reintrainment of settled dust, either from the  
10 workers who came home with dust on their clothing, or from settled dust on household furnishings,  
11 including carpeting, sofas and chairs. The study demonstrated that low-level exposures to asbestos,  
12 such as the exposure one would have to a worker's clothes, can also cause mesothelioma. This study  
13 engendered several published articles authored by me on the subject of asbestos-associated diseases  
14 among family members, and these articles are listed on my curriculum vitae which is appended to  
15 this affidavit (See attachment A). These follow-up studies show that asbestos exposure in the  
16 household places family members at risk for mesothelioma and lung cancer.

17           5.       I was the principal investigator and author of a published epidemiological study  
18 involving asbestos-related cancer deaths of Wisconsin state employees. In this study, we reviewed  
19 the death certificates of state employees and identified those employees who died of mesothelioma,  
20 a form of cancer of the pleura. Mesothelioma is a marker disease, which means that asbestos  
21 exposure is the only known cause. The study identified a high incidence of mesothelioma among  
22 state workers, whose only known exposure to asbestos was working in buildings with asbestos-  
23 containing materials.

24           6.       Along with Dr. Ruth Lillis, I participated in the investigation of asbestos-associated  
25 diseases among building maintenance workers. This study found a significant increase in asbestosis  
26 among these persons, and the study also reported mesotheliomas among these workers. I am familiar

with other published studies on the incidence of asbestos-associated diseases among building

studies concluded that exposure to asbestos in public schools caused x-ray changes of asbestosis in maintenance and custodial workers. I find these studies to be reliable and to contain information useful in the formation of my opinions on the dangers from low level exposures to asbestos.

7. As a physician and epidemiologist who has been personally involved in research of asbestos-associated diseases, I have come to the following opinions regarding asbestos exposure in homes. These opinions are expressed to a reasonable degree of medical certainty:

- (a) Inhalation of all types of asbestos, including tremolite, actinolite and anthophyllite asbestos is capable of causing a number of serious and deadly diseases, including asbestosis, lung cancer and mesothelioma.
- (b) These diseases involve a latent process, meaning that symptoms or disease will not be manifest at the time of exposure, but rather after a considerable period of time has passed. In the case of mesothelioma and lung cancer, the latency period is approximately 15-40 years. Furthermore, in the case of mesothelioma, once the disease is diagnosed there is no known cure and the treatment options are limited.
- (c) Any exposure to asbestos adds to the risk of developing asbestos disease. There is no known level of exposure to asbestos below which it can be said with scientific certainty that no risk of developing asbestos disease exists.
- (d) Friable asbestos in homes can present a hazard to homeowners and contractors because disturbance of the material during ordinary activities, such as remodeling, can result in asbestos fibers becoming airborne. Once airborne, asbestos fibers can be inhaled by persons in the home. Fibers not inhaled will eventually settle and contaminate surfaces.
- (e) When asbestos in settled dust is disturbed, it is reintrained into the air and may remain suspended for extended periods of time, resulting in additional exposure. Settled dust reintrainment is an important avenue of exposure for individuals who would not otherwise be exposed to asbestos.
- (f) Asbestos fibers are invisible to the naked eye and can only be identified through use of sophisticated microscopic equipment by highly trained professionals.
- (g) I have reviewed the results W.R. Grace's testing of its Zonolite Attic Insulation during installation, as well as the results of air and dust testing conducted by Fulcrum Environmental and Materials Analytical Services in homes with Zonolite Attic Insulation. In my


opinion, the results show that disturbance of asbestos-contaminated  
Zonolite Attic Insulation presents a significant hazard potential to

- (h) The hazard of these exposures is aggravated and worsened when the release or disturbance occurs in an enclosed space such as an attic.
- (i) Routine home maintenance, repairs and remodeling in and around asbestos-contaminated insulation should only be done by professionals trained in the use of personal protective equipment such as respirators and other safety techniques pertaining to isolation of the disturbance and preventing release to living spaces.
- (j) In order to safeguard public health, I believe it is essential that homeowners with Zonolite Attic Insulation be warned about the presence of asbestos in this product, be advised not to disturb the material, and be instructed on the precautions necessary to avoid exposure and contamination when conducting activities that disturb the material. Ultimately an abatement performed by professionals may be necessary to prevent hazardous exposures.

Further Affiant sayeth not.

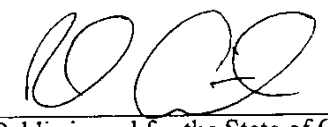
Dated this 20 day of July, 2000.

State of California  
County of Los Angeles

  
HENRY A. ANDERSON, MD

SUBSCRIBED AND SWORN to before me this 20<sup>th</sup> day of July, 2000.



  
Notary Public in and for the State of California  
Residing at Los Angeles, CA  
My commission expires: Aug. 13, 2002

**HENRY A. ANDERSON, M.D.**

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**PROFESSIONAL HISTORY**

10/91 - current	Chief Medical Officer for Occupational & Environmental Health Wisconsin Division of Health, Madison.
6/80 - current	State Epidemiologist for Occupational and Environmental Disease Wisconsin Division of Health, Madison.
6/89 - current	Adjunct Professor, Institute for Environmental Studies University of Wisconsin, Madison.
6/89 - current	Adjunct Professor of Preventive Medicine University of Wisconsin Medical School, Madison.
6/80 - current	Lecturer, Department of Community Medicine Mount Sinai School of Medicine, New York
6/80 - 10/91	Chief, Section of Environmental and Chronic Disease Epidemiology Wisconsin Division of Health, Madison.
6/85 - 6/89	Adjunct Associate Professor, Institute for Environmental Studies University of Wisconsin, Madison.
6/85 - 6/89	Adjunct Associate Professor of Preventive Medicine University of Wisconsin Medical School, Madison.
6/80 - 6/85	Adjunct Assistant Professor of Preventive Medicine University of Wisconsin Medical School, Madison.
1/78 - 6/80	Assistant Professor of Community Medicine Environmental Sciences Laboratory Mount Sinai School of Medicine, New York



Mount Sinai School of Medicine, New York

1/77 - 1/78	Instructor, Department of Community Medicine Mount Sinai School of Medicine, New York
1/76 - 1/77	Assistant, Department of Community Medicine Mount Sinai School of Medicine, New York
1/76 - 1/77	Research Fellow, Department of Medicine Mount Sinai School of Medicine, New York
6/73 - 6/76	Research Fellow, Department of Community Medicine Mount Sinai School of Medicine, New York
6/73 - 6/76	Resident in Occupational and Environmental Medicine Environmental Sciences Laboratory Mount Sinai School of Medicine, New York
6/72 - 6/73	Straight Medical Internship, Department of Medicine Montefiore Hospital and Medical Center, Bronx, NY

## **ACADEMIC RECORD**

1968	B.A., Stanford University, Stanford, CA
1972	M.D., University of Wisconsin Medical School, Madison.

## **SPECIALTY BOARD CERTIFICATION**

1977	American Board of Preventive Medicine Sub-specialty - Occupational and Environmental Medicine
1983	Fellow, American College of Epidemiology
1985	Certified "B" Reader for Pneumoconiosis Radiographs under Federal Mine Safety and Health Act of 1977 and its amendments. Recertified July 1989, July 1993, July 1997.



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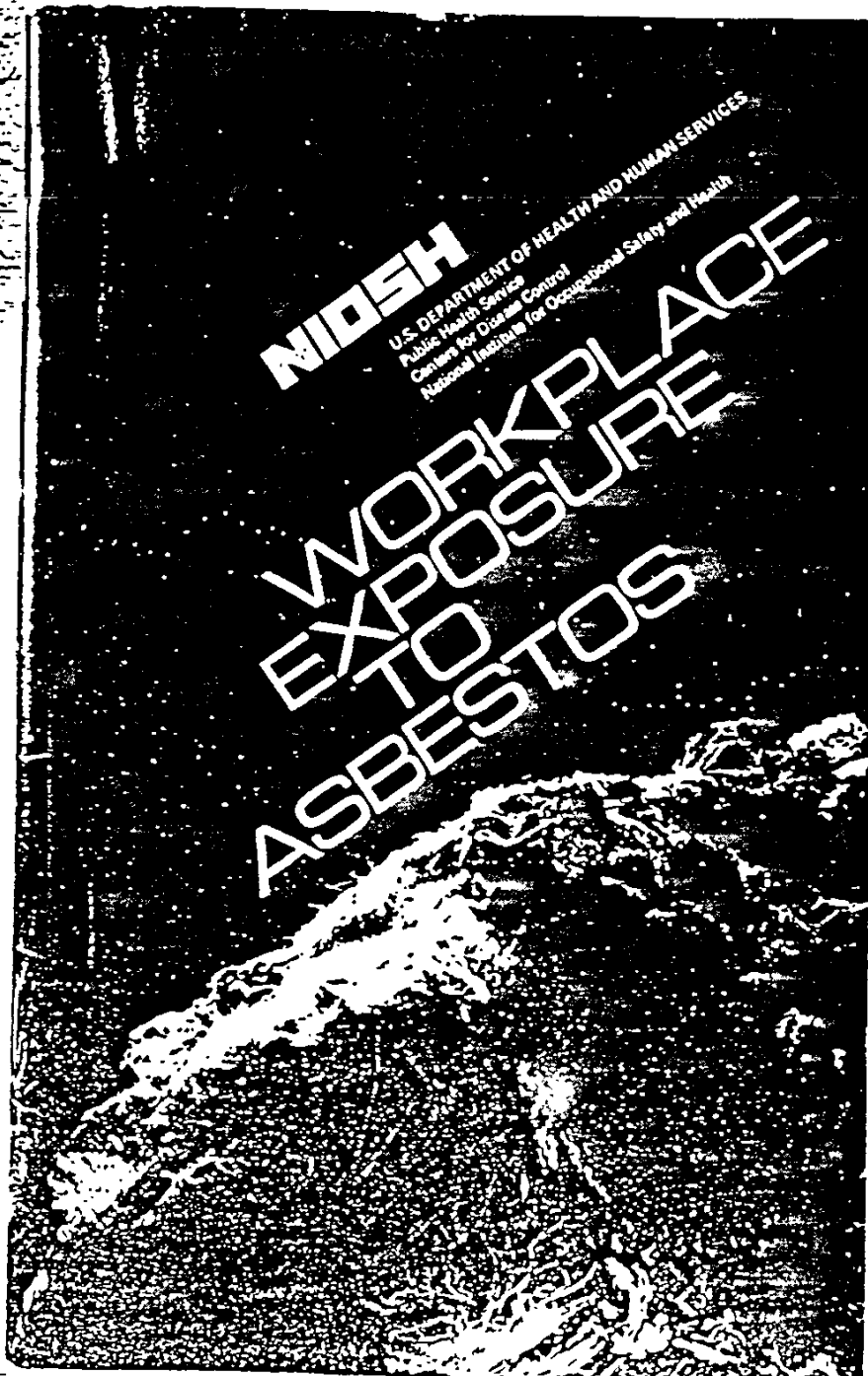
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February 2000- current

# **EXHIBIT G**



PLAINTIFF'S  
EXHIBIT  
38  
MDL 1372

EXHIBIT  
24  
Emergency Notice

**WORKPLACE EXPOSURE TO ASBESTOS**  
**Review and Recommendations**

DHHS (NIOSH) Publication No. 81-103

NIOSH-OSHA  
Asbestos Work Group  
April 1980

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES**  
Public Health Service  
Centers for Disease Control  
National Institute for Occupational Safety and Health

**U.S. DEPARTMENT OF LABOR**  
Occupational Safety and Health Administration

November 1980

For sale by the Superintendent of Documents U.S. Government  
Printing Office, Washington, D.C. 10402

Available data show that the lower the exposure, the lower the risk of developing asbestosis and cancer. Excessive cancer risks, however, have been demonstrated at all fiber concentrations studied to date. Evaluation of all available human data provides no evidence for a threshold or for a "safe" level of asbestos exposure. Accordingly, the committee recommends that, to the extent uses of asbestos cannot be eliminated or less toxic materials substituted for asbestos, worker exposures to asbestos must be controlled to the maximum extent possible.

*4. Inadequacy of Current 2,000,000-Fiber Occupational Standard.* The committee concluded that a variety of factors demonstrates that the current 2,000,000-fiber standard is grossly inadequate to protect American workers from asbestos-related disease. First, the 2,000,000-fiber standard was designed in 1969 by the British Occupational Hygiene Society (BOHS) for the limited purpose of minimizing asbestosis. Disease prevalence data from the BOHS study population collected subsequent to 1969 strongly suggest that this standard is insufficient to prevent a large incidence of asbestosis. Second, all levels of asbestos exposure studied to date have demonstrated asbestos-related disease, and a linear relationship appears to best describe the shape of the dose-response curve. These considerations led the committee to conclude that there is no level of exposure below which clinical effects do not occur. Third, the absence of a threshold is further indicated by the dramatic evidence of asbestos-related disease in members of asbestos-worker households and in persons living near asbestos-contaminated areas. These household and community contacts involved low level and/or intermittent casual exposure to asbestos. Studies of duration of exposure suggest that even at very short exposure periods (1 day to 3 months) significant disease can occur.

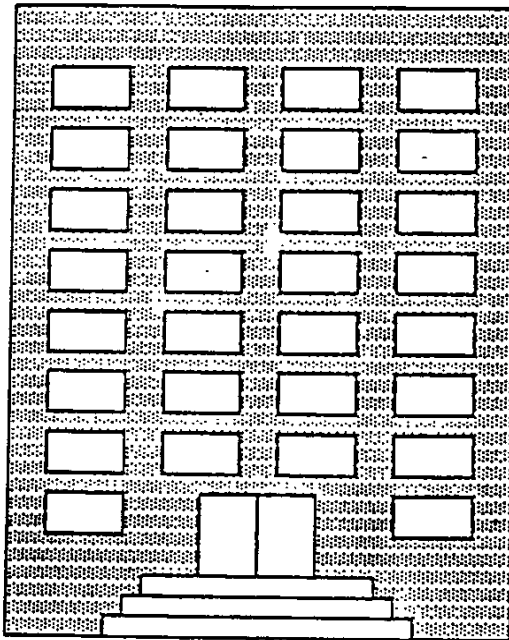
Although various models can be and have been fashioned to postulate possible dose-response relationships involving asbestos, the committee believes that the limited current data preclude the creation of any one empirical curve to describe the exact dose-response relationship. Over the last three decades, measurement techniques for asbestos have changed in several crucial respects, and there have been no suitable methods available to date to compare the results of prior techniques to current methods.



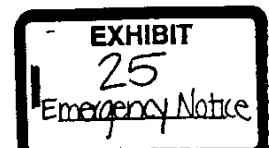
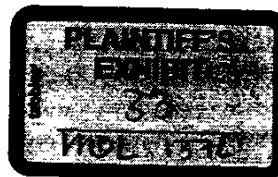
# **EXHIBIT H**

# EPA STUDY OF ASBESTOS-CONTAINING MATERIALS IN PUBLIC BUILDINGS

*A Report To Congress*



U.S. Environmental Protection Agency  
Washington, D.C.  
February, 1988



found in persons living in the households of asbestos workers (Selikoff et al., 1982) or living near asbestos mining areas, asbestos product factories, or shipyards where there was heavy use of asbestos (USEPA, 1980; NRC, 1984). As is typically done for other carcinogens, health effects associated with low level nonoccupational exposure to airborne asbestos fibers in public and commercial buildings have been inferred by extrapolating data from laboratory and occupational studies (USEPA, 1986). However, as with many other environmental pollutants, the validity of extrapolating from high level exposure to low level exposure has never been demonstrated empirically.

#### Summary

Asbestos is known to be extremely hazardous, based upon studies of both laboratory animals and asbestos workers and their families. Several life-threatening diseases, such as lung cancer and mesothelioma, can be caused by exposure to airborne asbestos. No safe threshold has been established for asbestos. Effects at low levels of nonoccupational exposure have been estimated by extrapolation from higher levels although the validity of this approach has not been empirically demonstrated.

# EXHIBIT I

United States  
Environmental Protection  
Agency

Office of  
Toxic Substances  
Washington, D.C. 20460

C00090  
March 1979

Toxic Substances

EPA

# Asbestos- Containing Materials in School Buildings:

Part 1

## A Guidance Document

PLAINTIFF'S  
EXHIBIT

39

MDL 1376

EXHIBIT

26

Emergency Notice

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# **Asbestos- Containing Materials in School Buildings:**

A Guidance  
Document

Part 1

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March 16, 1979

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Dear School Officials:

Until recently exposure to asbestos was generally considered an occupational health hazard for asbestos workers. However, now we have learned of an equally serious exposure problem that can occur in all types of buildings in which certain asbestos-containing materials have been used for fireproofing, insulation, and decoration. Asbestos can be released from these materials and contaminate the building environment. Individuals who are then exposed to the asbestos could develop lung cancer or cancers of other parts of the body. Unfortunately, detection of asbestos-related diseases is difficult since the latency period between exposure and appearance of the disease is sometimes as many as 20 to 40 years.

Since these materials are found in school buildings, we EPA are particularly concerned with the exposure of school children. EPA has worked with the States to develop a program that responds to the need for accurate information and guidance to deal with this difficult problem. The enclosed manuals are a major part of this program and are being mailed to all public school districts. They were prepared to inform you of the health hazards associated with asbestos and outline the steps you and the schools in your district can take to identify asbestos-containing materials and to protect students and school personnel from exposure.

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Also participating in this EPA program are the Department of Health, Education, and Welfare, the Occupational Safety and Health Administration, and the Consumer Product Safety Commission. Through the Regional Offices located in major cities across the country, EPA and these Agencies will provide assistance for the difficulties that you may encounter in undertaking a control program in your schools. We are operating several toll-free numbers that you can call to ask for information and assistance. A videotape that was prepared to supplement this manual will also be available for your use.

A survey form is included in this manual. The form asks questions on the results of the control programs you conduct in your schools. Your participation in this part of the EPA program would be appreciated. By completing the form you will assist us in assessing the extent of the asbestos-containing material problem in the United States.

I encourage you and your staff to review the enclosed manuals and inform the schools in your district of the EPA program. A successful nationwide school asbestos program depends on your efforts and those of school officials across the country. We look forward to working with you in the important weeks and months ahead.

Sincerely,



Steven D. Jellinek  
Assistant Administrator  
for Toxic Substances



## Chapter 1: Introduction: The Concern

Exposure to asbestos was initially associated with a chronic and debilitating lung disease called asbestosis. More recently exposure to asbestos has been associated with lung cancer, a rare cancer of the chest and abdominal lining called mesothelioma, and cancers of the esophagus, stomach, colon, and other organs. Asbestos also acts as a potent cancer-causing agent in combination with cigarette smoking. In all asbestos-related diseases there is a latency or induction period of many years between initial exposure and appearance of the disease.

In most cases asbestosis has followed long exposure to high levels of asbestos fibers. Therefore, asbestosis is not as significant a concern in schools as cancer risk. The potential for increasing cancer risk may exist at much lower and shorter exposures than those for asbestosis.

Under certain conditions, exposure to fibers released from asbestos-containing materials in buildings can reach levels considered potentially hazardous. Some asbestos levels measured in school buildings have even been shown to briefly exceed the current Federal workplace exposure level standards.

### Why is there so much concern now?

EPA is concerned in view of the increasing knowledge of the potential of asbestos as a cancer-inducing agent at low-level exposures and the asbestos contamination that has been found in some schools. Another very important concern is that cigarette smoking can enhance the disease potential of asbestos exposure.

### Is there a safe level of exposure?

EPA and the scientific community believe that any exposure to asbestos involves some health risk. No safe level of exposure (or threshold exposure level) has been established. Further, it is impossible at this time to confidently estimate the exact degree of risk associated with low-level exposures.

### What is considered the best or safest approach to asbestos exposure?

Where possible all exposure to asbestos should be eliminated or controlled.

### Are there special concerns about asbestos in schools?

The school children population differs from other non-occupational populations in age, population density, and behavior.

The exposure of children and adolescents to asbestos in the school building occurs early in their life span. Their remaining life expectancy provides a long development period for asbestos-related diseases.

A large number of students can be exposed at one time to asbestos that is released from asbestos-containing materials present in the school building. The duration of exposure is of concern since school children attend school daily for most of the year.

The school population is very active. Certain asbestos-containing materials can be damaged during school activities and as a result of the capricious behavior of students. When the material is damaged, asbestos fibers are released and exposure can occur. Many cases of badly damaged asbestos-containing materials have been found in schools.

### Are there any Federal laws or regulations that protect school children from asbestos exposure in school buildings?

There are currently no Federal laws or regulations that protect children in school buildings where asbestos-containing materials are already present.

### Is a medical examination necessary for persons exposed to asbestos in school buildings?

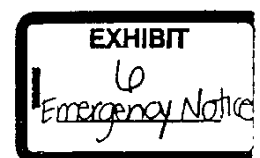
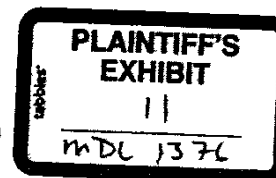
Medical examinations are not recommended in school exposure situations. It is difficult to detect asbestos-related diseases in children due to the long induction period before the disease appears. Individuals who have been exposed to asbestos should avoid smoking; and, of course, medical advice should be obtained for any specific concerns or symptoms.

# **EXHIBIT J**

**Expenditures for Residential Improvements and Repairs by Property Type, Quarterly 1962-1998**  
**Not Seasonally Adjusted in Millions of Dollars**

All Sizes of Residential Properties

	Total Expenditures	Maintenance and Repairs	Total Improvements	Additions and Alterations	Additions	Alterations	Outside Adds/Alts	Major Replacements
1962	11,024	4,843	6,181	4,442	890	2,622	930	1,739
First Quarter	2,050	1,027	1,023	654	94	447	113	369
Second Quarter	3,240	1,329	1,911	1,448	213	864	371	463
Third Quarter	3,051	1,382	1,669	1,146	235	614	297	523
Fourth Quarter	2,683	1,105	1,578	1,194	348	697	149	384
1963	11,407	5,010	6,397	4,690	1,142	2,424	1,124	1,707
First Quarter	2,132	1,014	1,118	835	164	501	170	283
Second Quarter	2,985	1,273	1,712	1,303	320	632	351	409
Third Quarter	3,487	1,500	1,987	1,387	391	630	366	600
Fourth Quarter	2,803	1,223	1,580	1,165	267	661	237	415
1965	11,442	4,999	6,443	4,736	1,209	2,560	967	1,707
First Quarter	2,420	1,156	1,264	949	155	645	149	315
Second Quarter	2,939	1,299	1,640	1,186	285	618	283	454
Third Quarter	3,440	1,437	2,003	1,467	410	719	338	536
Fourth Quarter	2,643	1,107	1,536	1,134	359	578	197	402
1966	11,691	4,803	6,888	4,976	1,202	2,895	879	1,912
First Quarter	2,134	942	1,192	921	235	576	109	272
Second Quarter	2,744	1,302	1,442	1,112	320	523	268	330
Third Quarter	3,932	1,458	2,474	1,707	310	1,069	328	767
Fourth Quarter	2,881	1,101	1,780	1,236	337	726	173	543
1967	11,687	4,431	7,256	5,321	1,146	3,118	1,057	1,935
First Quarter	2,055	852	1,202	898	136	627	135	305
Second Quarter	3,415	1,225	2,190	1,595	319	907	368	595
Third Quarter	3,345	1,298	2,047	1,446	345	723	378	602
Fourth Quarter	2,872	1,055	1,817	1,383	345	862	176	434
1968	12,703	5,186	7,517	5,314	1,261	3,077	976	2,202
First Quarter	2,182	865	1,317	902	156	621	125	416
Second Quarter	3,498	1,430	2,068	1,547	412	742	393	522
Third Quarter	4,036	1,675	2,361	1,692	463	933	296	669
Fourth Quarter	2,987	1,217	1,770	1,174	231	781	161	596
1969	13,535	5,479	8,055	5,885	1,094	3,409	1,382	2,170
First Quarter	2,299	941	1,358	1,001	128	679	194	357
Second Quarter	3,796	1,467	2,329	1,820	464	882	474	509
Third Quarter	4,446	1,778	2,668	1,863	325	1,015	523	805
Fourth Quarter	2,994	1,293	1,701	1,201	177	832	192	499
1970	14,770	5,895	8,875	6,246	1,411	3,539	1,296	2,629
First Quarter	2,666	1,047	1,619	1,193	154	914	125	426
Second Quarter	4,232	1,673	2,559	1,816	385	987	444	743
Third Quarter	4,196	1,848	2,349	1,620	381	813	426	729
Fourth Quarter	3,676	1,328	2,348	1,617	491	825	302	731
1971	16,299	6,361	9,939	6,818	1,685	3,699	1,433	3,120
First Quarter	2,781	1,082	1,699	1,163	260	780	125	536
Second Quarter	4,553	1,662	2,890	2,040	497	1,050	493	850
Third Quarter	5,036	2,139	2,897	1,894	399	993	502	1,002
Fourth Quarter	3,930	1,477	2,453	1,721	529	879	313	731
1972	17,498	6,717	10,781	7,526	1,378	4,447	1,701	3,255
First Quarter	3,152	1,192	1,961	1,330	187	938	205	631
Second Quarter	4,839	1,760	3,079	2,314	465	1,124	728	766
Third Quarter	5,224	2,154	3,070	2,136	434	1,152	551	934
Fourth Quarter	4,283	1,612	2,671	1,747	292	1,233	222	925



**Expenditures for Residential Improvements and Repairs by Property Type, Quarterly 1962-1998**  
**Not Seasonally Adjusted in Millions of Dollars**

**All Sizes of Residential Properties**

	Total Expenditures	Maintenance and Repairs	Total Improvements	Additions and Alterations	Additions	Alterations	Outside Adds/AKs	Major Replacements
1973	18,512	7,924	10,588	7,386	1,360	4,694	1,332	3,202
First Quarter	3,447	1,269	2,178	1,646	303	1,214	129	532
Second Quarter	4,676	2,104	2,571	1,786	436	916	434	785
Third Quarter	5,487	2,489	2,998	2,066	349	1,139	578	932
Fourth Quarter	4,902	2,061	2,842	1,889	273	1,424	192	953
1974	21,114	8,491	12,622	8,060	1,529	4,836	1,695	4,563
First Quarter	4,112	1,700	2,412	1,414	186	1,053	175	998
Second Quarter	5,363	2,225	3,137	2,006	390	1,076	540	1,131
Third Quarter	6,411	2,426	3,985	2,442	473	1,371	598	1,543
Fourth Quarter	5,228	2,140	3,088	2,199	480	1,337	382	890
1975	25,239	9,758	15,481	10,997	1,971	6,844	2,182	4,484
First Quarter	4,312	1,759	2,553	1,875	195	1,406	274	678
Second Quarter	6,867	2,477	4,390	3,124	439	1,982	703	1,266
Third Quarter	7,603	2,820	4,783	3,371	832	1,783	756	1,413
Fourth Quarter	6,456	2,701	3,755	2,627	505	1,674	448	1,128
1976	29,034	11,379	17,655	12,314	3,493	6,367	2,454	5,341
First Quarter	5,656	2,211	3,445	2,470	492	1,612	367	975
Second Quarter	8,616	3,348	5,268	3,767	879	1,818	1,069	1,501
Third Quarter	7,465	3,317	4,149	2,556	719	1,309	528	1,592
Fourth Quarter	7,297	2,503	4,793	3,521	1,402	1,629	490	1,273
1977	31,280	11,344	19,936	14,237	2,655	8,505	3,077	5,699
First Quarter	5,902	2,354	3,548	2,552	254	1,883	415	996
Second Quarter	8,636	3,072	5,564	4,298	1,145	2,062	1,092	1,266
Third Quarter	9,580	3,278	6,303	4,290	670	2,445	1,175	2,013
Fourth Quarter	7,161	2,641	4,521	3,097	587	2,115	395	1,424
1978	37,461	12,909	24,552	16,458	3,713	8,443	4,302	8,094
First Quarter	6,282	2,143	4,140	2,655	620	1,737	297	1,484
Second Quarter	10,747	3,549	7,198	5,093	1,208	2,495	1,390	2,106
Third Quarter	11,172	3,970	7,202	4,828	1,008	2,366	1,454	2,374
Fourth Quarter	9,260	3,247	6,012	3,882	876	1,845	1,161	2,130
1979	42,231	14,950	27,281	18,285	3,280	9,642	5,363	8,996
First Quarter	7,671	2,571	5,098	3,508	493	2,435	580	1,590
Second Quarter	11,755	4,152	7,603	5,324	1,408	2,021	1,895	2,279
Third Quarter	12,133	4,434	7,700	4,965	614	2,611	1,740	2,735
Fourth Quarter	10,674	3,793	6,880	4,489	766	2,575	1,147	2,392
1980	46,338	15,187	31,151	21,336	4,183	11,193	5,960	9,816
First Quarter	9,217	2,985	6,232	4,271	499	2,367	1,406	1,960
Second Quarter	12,534	4,188	8,346	5,875	1,065	2,700	2,110	2,471
Third Quarter	12,981	4,331	8,650	5,744	1,386	2,824	1,534	2,906
Fourth Quarter	11,606	3,683	7,923	5,445	1,232	3,302	911	2,478
1981	46,351	16,022	30,329	20,414	3,164	11,947	5,303	9,915
First Quarter	8,723	2,941	5,781	4,101	520	3,188	392	1,681
Second Quarter	12,835	4,357	8,478	5,732	670	3,133	1,928	2,746
Third Quarter	13,606	5,019	8,587	5,378	947	2,629	1,801	3,209
Fourth Quarter	11,187	3,704	7,483	5,204	1,026	2,997	1,182	2,279
1982	45,291	16,810	28,481	18,774	2,641	10,711	5,423	9,707
First Quarter	8,187	3,332	4,855	3,261	387	2,031	843	1,594
Second Quarter	12,835	4,511	8,323	5,930	868	3,198	1,865	2,393
Third Quarter	11,639	4,597	7,042	4,264	695	2,217	1,352	2,778
Fourth Quarter	12,630	4,370	8,260	5,319	690	3,265	1,364	2,941

**Expenditures for Residential Improvements and Repairs by Property Type, Quarterly 1962-1998**  
**Not Seasonally Adjusted in Millions of Dollars**

**All Sizes of Residential Properties**

	Total Expenditures	Maintenance and Repairs	Total Improvements	Additions and Alterations	Additions	Alterations	Outside Adds/Alts	Major Replacements
1983	49,295	18,128	31,167	20,271	4,739	11,673	3,859	10,895
First Quarter	8,887	3,510	5,377	3,902	294	2,995	613	1,475
Second Quarter	12,837	4,481	8,356	5,800	2,655	2,358	787	2,556
Third Quarter	16,133	5,300	10,833	7,116	1,299	3,757	2,061	3,716
Fourth Quarter	11,439	4,837	6,602	3,454	492	2,564	398	3,147
1984	69,784	28,894	40,890	27,822	6,007	14,486	7,329	13,067
First Quarter	11,895	4,805	7,090	5,097	1,136	3,323	638	1,993
Second Quarter	20,539	8,679	11,860	7,526	1,368	3,298	2,860	4,334
Third Quarter	20,196	8,884	11,312	7,535	1,895	3,295	2,345	3,777
Fourth Quarter	17,154	6,526	10,628	7,664	1,608	4,570	1,486	2,963
1985	80,267	35,358	44,909	28,775	3,966	17,599	7,211	16,134
First Quarter	15,935	7,232	8,704	5,573	565	4,157	851	3,131
Second Quarter	19,805	9,374	10,432	7,132	1,059	3,698	2,375	3,300
Third Quarter	21,706	9,267	12,439	8,027	1,154	4,464	2,409	4,412
Fourth Quarter	22,821	9,486	13,335	8,043	1,187	5,281	1,575	5,292
1986	91,274	35,971	55,303	38,608	7,377	21,192	10,040	16,695
First Quarter	17,542	7,603	9,939	6,689	1,043	4,483	1,162	3,250
Second Quarter	23,074	8,234	14,839	11,098	2,130	5,855	3,113	3,742
Third Quarter	28,603	11,318	17,285	11,572	2,386	4,904	4,283	5,713
Fourth Quarter	22,055	8,816	13,239	9,249	1,817	5,950	1,481	3,991
1987	94,087	38,231	55,856	39,980	9,557	21,642	8,780	15,876
First Quarter	18,020	7,763	10,257	7,234	1,328	4,234	1,672	3,024
Second Quarter	23,783	8,828	14,955	11,360	3,076	5,801	2,482	3,596
Third Quarter	27,712	10,267	17,445	12,094	3,222	5,895	2,977	5,351
Fourth Quarter	24,572	11,374	13,198	9,293	1,932	5,711	1,650	3,905
1988	101,117	40,885	60,232	43,339	11,333	22,703	9,303	16,893
First Quarter	18,511	9,147	9,363	6,400	873	3,964	1,563	2,963
Second Quarter	28,747	10,416	18,331	13,704	4,085	6,202	3,416	4,627
Third Quarter	30,282	12,189	18,093	13,039	3,959	7,016	2,065	5,054
Fourth Quarter	23,577	9,133	14,444	10,196	2,416	5,521	2,258	4,248
1989	100,891	42,689	58,202	39,786	6,828	23,129	9,828	18,415
First Quarter	19,349	8,184	11,165	8,025	1,491	5,195	1,341	3,139
Second Quarter	24,589	9,462	15,126	10,755	1,444	6,504	2,806	4,373
Third Quarter	30,890	13,096	17,794	11,726	2,349	6,182	3,195	6,068
Fourth Quarter	26,063	11,947	14,116	9,279	1,544	5,248	2,486	4,836
1990	106,773	51,305	55,468	37,253	8,561	21,920	6,771	18,215
First Quarter	22,311	10,330	11,979	7,964	1,879	5,162	924	4,016
Second Quarter	27,314	12,722	14,592	10,552	2,486	5,902	2,163	4,040
Third Quarter	30,154	14,318	15,836	10,349	2,410	5,621	2,319	5,487
Fourth Quarter	26,995	13,934	13,061	8,387	1,785	5,237	1,365	4,673
1991	97,528	49,840	47,688	30,944	7,914	16,076	6,954	16,744
First Quarter	18,847	11,230	7,617	4,770	671	3,240	860	2,847
Second Quarter	24,904	11,808	13,096	10,125	2,647	5,269	2,207	2,972
Third Quarter	28,842	13,698	15,144	8,991	2,805	3,738	2,448	6,153
Fourth Quarter	24,934	13,104	11,830	7,058	1,790	3,830	1,438	4,771
1992	103,734	45,154	58,580	40,186	6,783	22,700	10,704	18,393
First Quarter	18,658	8,674	9,986	7,324	1,652	4,843	828	2,661
Second Quarter	30,436	13,583	16,853	11,474	1,646	5,867	3,960	5,379
Third Quarter	27,587	11,970	15,615	10,423	2,143	4,780	3,501	5,192
Fourth Quarter	27,055	10,928	16,127	10,966	1,342	7,210	2,414	5,162

**Expenditures for Residential Improvements and Repairs by Property Type, Quarterly 1962-1998**  
**Not Seasonally Adjusted in Millions of Dollars**

All Sizes of Residential Properties

	Total Expenditures	Maintenance and Repairs	Total Improvements	Additions and Alterations	Additions	Alterations	Outside Adds/Alts Replacements	Major
1993	108,304	41,699	66,606	45,797	12,757	24,782	8,259	20,809
First Quarter	19,709	8,840	10,869	7,719	1,277	5,510	931	3,150
Second Quarter	28,422	10,193	18,229	11,863	3,848	5,248	2,767	6,366
Third Quarter	31,528	11,412	20,115	14,167	3,972	7,036	3,158	5,948
Fourth Quarter	28,645	11,253	17,392	12,048	3,659	6,987	1,402	5,344
1994	115,030	42,953	72,077	48,828	9,647	28,673	10,509	23,248
First Quarter	21,191	8,564	12,627	9,900	2,725	5,554	1,621	2,727
Second Quarter	30,988	10,811	20,177	14,518	3,158	7,350	4,009	5,659
Third Quarter	32,297	11,890	20,407	13,240	2,344	7,946	2,949	7,167
Fourth Quarter	30,553	11,688	18,866	11,171	1,419	7,823	1,929	7,695
1995	111,683	42,047	69,636	44,726	7,936	26,893	9,897	24,910
First Quarter	21,777	7,877	13,900	10,032	1,049	7,435	1,549	3,868
Second Quarter	31,139	11,213	19,927	13,399	3,223	7,621	2,554	6,528
Third Quarter	32,054	12,269	19,784	11,576	2,644	5,853	3,078	8,208
Fourth Quarter	26,713	10,688	16,025	9,719	1,020	5,983	2,716	6,306
1996	114,919	36,997	77,922	53,456	12,035	30,064	11,357	24,465
First Quarter	21,116	7,195	13,921	9,419	1,896	6,376	1,148	4,502
Second Quarter	29,591	10,096	19,495	14,207	2,997	8,666	2,543	5,288
Third Quarter	34,087	9,767	24,320	15,490	3,768	7,649	4,073	8,830
Fourth Quarter	30,126	9,940	20,186	14,340	3,374	7,374	3,592	5,846
1997	118,569	38,576	79,993	55,530	11,042	33,046	11,442	24,463
First Quarter	21,016	6,123	14,893	10,540	1,411	7,827	1,302	4,353
Second Quarter	32,564	10,858	21,696	16,088	3,891	7,538	4,659	5,607
Third Quarter	36,566	12,413	24,153	15,794	3,364	8,916	3,513	8,359
Fourth Quarter	28,422	9,171	19,252	13,108	2,375	8,765	1,968	6,144
1998	120,661	39,326	81,335	53,868	10,092	32,784	10,992	27,467
First Quarter	22,693	7,175	15,518	11,070	1,790	7,376	1,904	4,448
Second Quarter	35,707	11,116	24,591	17,673	3,660	10,899	3,114	6,918
Third Quarter	33,128	11,599	21,528	12,954	1,898	6,974	4,082	8,575
Fourth Quarter	29,134	9,436	19,698	12,172	2,744	7,535	1,893	7,525

**Expenditures for Residential Improvements and Repairs by Property Type, Quarterly 1962-1998**  
**Not Seasonally Adjusted in Millions of Dollars**

1 to 4 Unit Owner Occupied

	Total Expenditures	Maintenance and Repairs	Total Improvements	Additions and Alterations	Additions	Alterations	Outside Adds/Alts	Major Replacements
1962	7,105	2,832	4,273	3,021	669	1,731	621	1,252
First Quarter	1,272	532	740	486	63	339	84	254
Second Quarter	2,060	832	1,228	893	167	486	240	335
Third Quarter	2,098	865	1,233	858	175	487	196	375
Fourth Quarter	1,675	603	1,072	784	264	419	101	288
1963	7,852	2,875	4,977	3,690	878	1,885	927	1,287
First Quarter	1,292	503	789	587	113	358	116	202
Second Quarter	2,226	792	1,434	1,127	293	518	316	307
Third Quarter	2,448	900	1,548	1,068	303	476	289	480
Fourth Quarter	1,886	680	1,206	908	169	533	206	298
1965	7,750	2,726	5,024	3,895	959	2,122	814	1,129
First Quarter	1,444	538	906	755	99	553	103	151
Second Quarter	2,088	754	1,334	1,019	250	520	249	315
Third Quarter	2,434	829	1,605	1,205	372	537	296	400
Fourth Quarter	1,784	605	1,179	916	238	512	166	263
1966	7,934	2,378	5,556	4,220	992	2,498	729	1,336
First Quarter	1,444	439	1,005	817	218	516	83	188
Second Quarter	1,940	729	1,211	991	265	491	235	220
Third Quarter	2,709	764	1,945	1,401	268	854	279	544
Fourth Quarter	1,841	445	1,395	1,011	242	637	132	384
1967	7,954	2,210	5,744	4,419	920	2,573	926	1,326
First Quarter	1,239	372	866	672	75	497	100	195
Second Quarter	2,389	652	1,737	1,301	270	697	334	437
Third Quarter	2,356	687	1,669	1,246	281	628	337	423
Fourth Quarter	1,970	499	1,471	1,200	294	751	155	271
1968	8,966	2,692	6,274	4,618	1,093	2,675	850	1,656
First Quarter	1,405	372	1,033	732	109	520	103	302
Second Quarter	2,556	769	1,788	1,370	378	625	368	418
Third Quarter	2,961	956	2,005	1,519	406	861	251	486
Fourth Quarter	2,043	596	1,448	997	201	660	127	450
1969	9,431	2,858	6,573	5,071	942	2,952	1,178	1,501
First Quarter	1,626	459	1,167	913	110	617	185	254
Second Quarter	2,955	879	2,076	1,663	422	795	447	413
Third Quarter	3,023	933	2,090	1,553	267	896	391	536
Fourth Quarter	1,826	587	1,240	942	143	644	155	298
1970	10,448	3,150	7,299	5,309	1,262	2,935	1,112	1,990
First Quarter	1,762	445	1,317	1,019	131	788	100	298
Second Quarter	3,118	981	2,137	1,533	341	794	397	605
Third Quarter	2,963	1,057	1,906	1,364	327	674	363	542
Fourth Quarter	2,606	667	1,939	1,393	462	678	252	546
1971	11,201	3,174	8,028	5,791	1,366	3,171	1,255	2,236
First Quarter	1,898	514	1,384	1,010	235	674	101	375
Second Quarter	3,368	884	2,483	1,817	429	943	446	666
Third Quarter	3,349	1,089	2,260	1,544	284	828	433	716
Fourth Quarter	2,586	686	1,900	1,420	418	727	275	480
1972	12,102	3,567	8,534	6,253	1,203	3,551	1,499	2,281
First Quarter	2,258	603	1,655	1,192	169	839	184	463
Second Quarter	3,489	970	2,518	1,914	417	874	623	605
Third Quarter	3,467	1,202	2,265	1,643	336	795	511	622
Fourth Quarter	2,888	792	2,096	1,505	282	1,043	180	591

**Expenditures for Residential Improvements and Repairs by Property Type, Quarterly 1962-1998**  
**Not Seasonally Adjusted in Millions of Dollars**

1 to 4 Unit Owner Occupied

	Total Expenditures	Maintenance and Repairs	Total Improvements	Additions and Alterations	Additions	Alterations	Outside Add/Alts Replacements	Major
1973	12,076	4,037	8,040	5,887	1,085	3,694	1,108	2,152
First Quarter	2,272	660	1,612	1,269	174	987	108	343
Second Quarter	3,215	1,115	2,100	1,577	406	784	387	523
Third Quarter	3,507	1,327	2,180	1,468	311	668	489	712
Fourth Quarter	3,083	935	2,148	1,574	194	1,254	125	574
1974	14,791	4,547	10,244	6,819	1,332	4,133	1,354	3,425
First Quarter	2,700	845	1,855	1,235	186	900	149	620
Second Quarter	4,084	1,330	2,754	1,834	370	1,006	458	920
Third Quarter	4,525	1,398	3,128	1,863	361	1,040	462	1,265
Fourth Quarter	3,481	974	2,507	1,887	415	1,187	285	620
1975	16,714	4,901	11,813	8,898	1,747	5,259	1,892	2,914
First Quarter	2,677	723	1,954	1,508	140	1,136	231	446
Second Quarter	5,029	1,372	3,658	2,645	422	1,595	629	1,013
Third Quarter	5,212	1,630	3,583	2,785	765	1,324	695	798
Fourth Quarter	3,795	1,176	2,619	1,960	419	1,204	337	658
1976	20,231	5,842	14,389	10,624	2,996	5,445	2,183	3,765
First Quarter	3,589	1,064	2,525	1,883	374	1,181	328	642
Second Quarter	6,203	1,717	4,486	3,421	824	1,592	1,005	1,066
Third Quarter	5,329	1,854	3,476	2,260	620	1,166	474	1,215
Fourth Quarter	5,109	1,207	3,902	3,059	1,177	1,506	376	843
1977	22,950	6,223	16,727	12,484	2,126	7,529	2,828	4,243
First Quarter	4,393	1,210	3,184	2,411	253	1,762	397	773
Second Quarter	6,234	1,807	4,426	3,439	821	1,634	984	987
Third Quarter	7,267	1,835	5,432	3,914	581	2,259	1,074	1,518
Fourth Quarter	5,056	1,371	3,685	2,719	471	1,874	374	966
1978	26,294	6,980	19,314	13,442	2,880	6,696	3,866	5,872
First Quarter	3,876	986	2,889	1,970	521	1,205	245	919
Second Quarter	7,592	2,216	5,377	3,795	667	1,776	1,352	1,581
Third Quarter	8,201	2,156	6,044	4,261	940	2,118	1,204	1,783
Fourth Quarter	6,625	1,622	5,003	3,415	753	1,597	1,065	1,588
1979	30,171	8,256	21,916	15,305	2,581	7,994	4,730	6,611
First Quarter	5,360	1,186	4,175	3,110	477	2,078	554	1,065
Second Quarter	8,258	2,322	5,935	4,152	963	1,502	1,686	1,783
Third Quarter	9,143	2,770	6,374	4,256	508	2,262	1,486	2,118
Fourth Quarter	7,410	1,978	5,432	3,788	632	2,152	1,004	1,645
1980	34,116	8,223	25,892	18,479	3,738	9,406	5,336	7,413
First Quarter	6,498	1,347	5,151	3,838	485	2,096	1,257	1,313
Second Quarter	9,355	2,279	7,076	5,159	859	2,340	1,960	1,917
Third Quarter	9,536	2,638	6,898	4,679	1,307	2,074	1,298	2,219
Fourth Quarter	8,727	1,960	6,767	4,803	1,086	2,897	820	1,964
1981	32,236	8,468	23,768	17,012	2,788	9,330	4,895	6,756
First Quarter	5,663	1,463	4,200	3,259	509	2,410	340	941
Second Quarter	8,929	2,292	6,637	4,747	529	2,397	1,821	1,890
Third Quarter	9,972	2,789	7,182	4,757	926	2,101	1,730	2,425
Fourth Quarter	7,672	1,923	5,749	4,250	825	2,422	1,003	1,499
1982	31,781	9,354	22,427	15,688	2,229	8,760	4,699	6,739
First Quarter	5,220	1,635	3,585	2,696	352	1,616	728	889
Second Quarter	8,873	2,475	6,398	4,663	756	2,261	1,646	1,735
Third Quarter	8,787	2,845	5,943	3,798	610	1,998	1,191	2,144
Fourth Quarter	8,900	2,399	6,501	4,530	511	2,885	1,134	1,971



**Expenditures for Residential Improvements and Repairs by Property Type, Quarterly 1962-1998**  
**Not Seasonally Adjusted in Millions of Dollars**

1 to 4 Unit Owner Occupied

	Total Expenditures	Maintenance and Repairs	Total Improvements	Additions and Alterations	Additions	Alterations	Outside Adds/Alts	Major Replacements
1983	34,358	9,481	24,877	17,280	4,277	9,569	3,434	7,597
First Quarter	5,548	1,598	3,950	3,086	268	2,272	546	863
Second Quarter	9,520	2,724	6,796	4,948	2,353	1,950	646	1,848
Third Quarter	12,233	3,110	9,123	6,159	1,196	2,982	1,981	2,964
Fourth Quarter	7,058	2,049	5,009	3,087	460	2,366	261	1,922
1984	46,631	16,391	30,241	23,416	5,320	11,667	6,428	6,825
First Quarter	7,029	2,543	4,486	3,714	972	2,209	533	772
Second Quarter	12,982	4,872	8,109	6,238	916	2,886	2,436	1,872
Third Quarter	14,104	4,982	9,122	7,006	1,861	2,985	2,160	2,116
Fourth Quarter	12,517	3,994	8,523	6,458	1,572	3,587	1,299	2,065
1985	50,810	17,475	33,335	23,448	3,402	13,530	6,515	9,887
First Quarter	9,550	2,886	6,664	5,056	563	3,770	723	1,608
Second Quarter	13,752	5,283	8,469	5,994	1,025	2,818	2,151	2,475
Third Quarter	14,016	5,034	8,982	6,506	979	3,256	2,271	2,476
Fourth Quarter	13,492	4,272	9,220	5,892	836	3,687	1,370	3,328
1986	57,722	17,506	40,216	31,217	6,401	16,467	8,350	8,999
First Quarter	9,960	3,462	6,498	5,101	889	3,520	693	1,397
Second Quarter	15,860	4,677	11,183	8,932	1,992	4,109	2,831	2,251
Third Quarter	17,497	5,101	12,396	9,187	2,013	3,570	3,604	3,209
Fourth Quarter	14,406	4,267	10,140	7,998	1,507	5,268	1,223	2,142
1987	58,094	18,374	39,720	31,999	8,189	16,297	7,513	7,721
First Quarter	10,460	3,794	6,666	5,579	1,146	3,005	1,428	1,087
Second Quarter	15,776	4,529	11,247	9,000	2,396	4,402	2,201	2,247
Third Quarter	18,153	4,925	13,227	10,578	2,960	4,950	2,668	2,649
Fourth Quarter	13,705	5,126	8,579	6,842	1,687	3,940	1,215	1,737
1988	65,445	19,918	45,527	35,654	9,264	18,299	8,091	9,873
First Quarter	10,395	3,887	6,508	4,772	836	2,582	1,354	1,737
Second Quarter	20,128	5,612	14,516	11,654	3,534	5,139	2,981	2,862
Third Quarter	19,161	5,661	13,500	10,525	3,001	5,806	1,717	2,975
Fourth Quarter	15,761	4,758	11,003	8,704	1,894	4,771	2,039	2,300
1989	62,838	19,886	42,952	32,674	6,464	17,636	8,573	10,278
First Quarter	11,533	3,757	7,777	6,118	1,406	3,676	1,036	1,658
Second Quarter	16,694	4,300	12,393	9,287	1,438	5,191	2,657	3,107
Third Quarter	19,302	6,086	13,216	10,002	2,108	5,065	2,829	3,214
Fourth Quarter	15,309	5,743	9,566	7,267	1,512	3,704	2,051	2,299
1990	63,287	22,850	40,436	29,804	7,196	17,258	5,350	10,632
First Quarter	13,016	4,710	8,305	6,446	1,877	3,950	620	1,859
Second Quarter	16,920	6,146	10,774	7,978	1,656	4,584	1,737	2,796
Third Quarter	18,311	6,435	11,876	8,500	2,362	4,293	1,845	3,376
Fourth Quarter	15,040	5,559	9,481	6,880	1,301	4,431	1,148	2,601
1991	61,913	25,107	36,806	26,684	6,831	13,887	5,966	10,122
First Quarter	10,690	5,079	5,611	4,093	559	2,787	747	1,518
Second Quarter	18,356	6,811	11,545	9,263	2,647	4,581	2,034	2,282
Third Quarter	19,008	7,638	11,371	7,800	2,594	2,994	2,213	3,570
Fourth Quarter	13,858	5,579	8,279	5,528	1,031	3,526	971	2,751
1992	69,859	24,921	44,937	34,827	6,226	19,753	8,848	10,110
First Quarter	12,678	4,629	8,050	6,526	1,492	4,238	796	1,523
Second Quarter	21,816	7,888	13,928	10,566	1,625	5,429	3,512	3,362
Third Quarter	18,369	7,467	10,900	8,289	1,829	3,965	2,496	2,611
Fourth Quarter	16,998	4,939	12,059	9,446	1,281	6,121	2,044	2,614

**Expenditures for Residential Improvements and Repairs by Property Type, Quarterly 1962-1998**  
**Not Seasonally Adjusted in Millions of Dollars**

1 to 4 Unit Owner Occupied

	Total Expenditures	Maintenance and Repairs	Total Improvements	Additions and Alterations	Additions	Alterations	Outside Adds/Alts	Major Replacements
1993	72.882	22.133	50.749	36.549	11.519	18.514	6.516	14.200
First Quarter	12.197	3.430	8.767	6.412	1.191	4.422	799	2.355
Second Quarter	19.330	5.841	13.489	9.446	3.040	4.072	2.334	4.043
Third Quarter	22.140	6.915	15.225	11.403	3.796	5.203	2.404	3.822
Fourth Quarter	19.216	5.948	13.268	9.288	3.492	4.817	979	3.980
1994	81.737	25.175	56.562	40.693	8.793	22.996	8.904	15.869
First Quarter	14.262	4.326	9.936	8.142	2.437	4.277	1.429	1.794
Second Quarter	23.342	6.553	16.789	12.878	2.962	6.472	3.444	3.912
Third Quarter	22.809	7.380	15.429	10.629	2.206	5.923	2.500	4.800
Fourth Quarter	21.323	6.915	14.408	9.045	1.189	6.325	1.531	5.363
1995	78.583	26.262	52.321	33.972	6.576	19.176	8.221	18.348
First Quarter	14.657	4.600	10.057	6.848	517	5.149	1.183	3.208
Second Quarter	23.799	7.932	15.867	10.573	2.904	5.521	2.148	5.295
Third Quarter	21.597	6.768	14.829	9.292	2.325	4.120	2.847	5.537
Fourth Quarter	18.530	6.962	11.568	7.259	829	4.387	2.043	4.309
1996	80.070	21.687	58.383	40.330	10.276	21.667	8.387	18.053
First Quarter	14.160	3.371	10.789	7.415	1.741	4.721	954	3.374
Second Quarter	21.866	6.265	15.601	11.407	2.739	6.746	1.922	4.194
Third Quarter	25.093	6.587	18.506	11.879	3.150	5.757	2.972	6.627
Fourth Quarter	18.951	5.464	13.487	9.628	2.645	4.444	2.539	3.859
1997	85.305	26.626	58.679	41.079	8.838	23.817	8.424	17.600
First Quarter	14.933	3.754	11.178	8.123	1.375	5.740	1,008	3,055
Second Quarter	23.621	7.398	16.223	11.826	2.767	5.282	3,777	4,397
Third Quarter	27.081	9.453	17.628	11.495	2.953	6.268	2,274	6,134
Fourth Quarter	19.671	6.021	13.650	9.635	1.743	6.527	1,365	4,014
1998	90.209	25.998	64.211	42.695	8.805	24.818	9.072	21.517
First Quarter	15.760	4.480	11.280	8.324	1,620	5,028	1,676	2,955
Second Quarter	26.809	7.331	19.478	13.882	3,252	8,096	2,534	5,596
Third Quarter	25.469	8.107	17.361	10.609	1,612	5,600	3,397	6,753
Fourth Quarter	22.171	6.079	16.092	9.879	2,321	6,094	1,464	6,213

**Expenditures for Residential Improvements and Repairs by Property Type, Quarterly 1962-1998**  
**Not Seasonally Adjusted in Millions of Dollars**

1 Unit Owner Occupied

	Total Expenditures	Maintenance and Repairs	Total Improvements	Additions and Alterations	Additions	Alterations	Outside Addis/Alts	Major Replacements
1962	6,036	2,313	3,723	2,706	596	1,548	562	1,017
First Quarter	1,110	443	667	449	61	308	80	218
Second Quarter	1,761	693	1,068	803	157	434	212	265
Third Quarter	1,776	695	1,081	779	167	433	179	302
Fourth Quarter	1,389	482	907	675	211	373	91	232
1963	6,760	2,401	4,359	3,256	785	1,585	886	1,103
First Quarter	1,074	427	647	505	89	309	107	142
Second Quarter	1,904	668	1,236	955	256	399	300	281
Third Quarter	2,135	743	1,392	981	291	414	276	411
Fourth Quarter	1,647	563	1,084	815	149	463	203	269
1965	7,033	2,382	4,651	3,658	915	1,986	757	993
First Quarter	1,293	469	824	692	98	493	101	132
Second Quarter	1,925	680	1,245	962	250	495	217	283
Third Quarter	2,190	704	1,486	1,155	360	515	280	331
Fourth Quarter	1,625	529	1,096	849	207	483	159	247
1966	7,133	2,067	5,066	3,928	992	2,252	683	1,138
First Quarter	1,326	390	936	772	218	472	83	164
Second Quarter	1,691	627	1,063	871	265	395	212	192
Third Quarter	2,476	669	1,807	1,318	268	782	269	488
Fourth Quarter	1,640	381	1,259	966	242	604	120	293
1967	7,024	1,935	5,089	3,994	828	2,303	863	1,094
First Quarter	1,091	333	758	607	64	453	90	151
Second Quarter	2,135	572	1,563	1,182	238	629	314	381
Third Quarter	2,034	595	1,439	1,122	238	563	321	317
Fourth Quarter	1,764	435	1,329	1,084	288	658	138	245
1968	8,089	2,350	5,739	4,315	1,054	2,487	775	1,424
First Quarter	1,288	327	961	688	109	477	102	273
Second Quarter	2,322	668	1,655	1,269	353	574	342	386
Third Quarter	2,676	838	1,838	1,433	402	827	205	405
Fourth Quarter	1,803	518	1,285	925	190	609	125	350
1969	8,594	2,469	6,125	4,740	920	2,676	1,144	1,384
First Quarter	1,475	391	1,084	852	109	562	182	231
Second Quarter	2,718	762	1,955	1,578	407	737	434	378
Third Quarter	2,764	815	1,949	1,445	263	796	386	504
Fourth Quarter	1,637	500	1,136	865	142	581	143	271
1970	9,469	2,753	6,716	4,973	1,206	2,695	1,072	1,742
First Quarter	1,615	385	1,230	946	129	720	96	284
Second Quarter	2,854	864	1,990	1,461	329	750	383	528
Third Quarter	2,710	929	1,781	1,281	319	616	347	500
Fourth Quarter	2,290	576	1,715	1,285	429	610	246	430
1971	10,234	2,853	7,381	5,366	1,275	2,890	1,201	2,015
First Quarter	1,729	462	1,267	906	189	619	98	361
Second Quarter	3,089	812	2,277	1,703	429	861	413	574
Third Quarter	3,053	980	2,073	1,418	247	750	421	655
Fourth Quarter	2,363	599	1,764	1,339	410	660	270	425
1972	11,128	3,193	7,935	5,809	1,117	3,249	1,443	2,127
First Quarter	2,116	546	1,570	1,137	168	788	181	433
Second Quarter	3,227	879	2,349	1,782	397	785	600	568
Third Quarter	3,124	1,083	2,040	1,482	298	692	492	558
Fourth Quarter	2,661	685	1,976	1,408	253	984	171	568

**Expenditures for Residential Improvements and Repairs by Property Type, Quarterly 1962-1998**  
**Not Seasonally Adjusted in Millions of Dollars**

1 Unit Owner Occupied

	Total Expenditures	Maintenance and Repairs	Total Improvements	Additions and Alterations	Additions	Alterations	Outside Add's/Alts	Major Replacements
1973	11,297	3,620	7,677	5,688	1,070	3,543	1,075	1,989
First Quarter	2,124	605	1,518	1,195	173	926	97	323
Second Quarter	2,962	994	1,968	1,544	402	769	374	424
Third Quarter	3,323	1,204	2,119	1,435	310	646	479	684
Fourth Quarter	2,888	817	2,071	1,513	186	1,203	125	558
1974	13,578	4,031	9,547	6,441	1,328	3,789	1,324	3,106
First Quarter	2,557	768	1,788	1,195	185	863	147	593
Second Quarter	3,684	1,180	2,504	1,666	369	865	432	838
Third Quarter	4,133	1,165	2,968	1,799	361	978	460	1,169
Fourth Quarter	3,204	918	2,286	1,781	413	1,083	285	506
1975	15,684	4,540	11,143	8,458	1,680	4,945	1,832	2,685
First Quarter	2,465	673	1,792	1,388	140	1,016	231	404
Second Quarter	4,703	1,232	3,470	2,517	416	1,515	586	954
Third Quarter	4,963	1,542	3,421	2,664	707	1,265	693	757
Fourth Quarter	3,553	1,093	2,460	1,889	417	1,149	323	570
1976	18,854	5,217	13,638	10,231	2,925	5,181	2,125	3,407
First Quarter	3,420	1,017	2,403	1,828	374	1,135	319	575
Second Quarter	5,897	1,555	4,342	3,299	767	1,549	983	1,043
Third Quarter	4,704	1,531	3,173	2,137	607	1,063	467	1,037
Fourth Quarter	4,834	1,114	3,720	2,968	1,177	1,434	357	752
1977	21,761	5,705	16,056	12,015	2,062	7,170	2,783	4,042
First Quarter	4,112	1,094	3,018	2,248	193	1,678	376	770
Second Quarter	5,968	1,631	4,337	3,386	819	1,592	976	951
Third Quarter	6,886	1,679	5,207	3,748	581	2,107	1,061	1,458
Fourth Quarter	4,796	1,301	3,495	2,632	469	1,794	370	863
1978	24,189	6,427	17,762	12,624	2,809	6,181	3,634	5,138
First Quarter	5,080	1,079	4,001	3,029	476	2,004	549	972
Second Quarter	7,926	2,162	5,763	4,071	955	1,458	1,658	1,692
Third Quarter	8,508	2,507	6,001	4,072	505	2,088	1,480	1,929
Fourth Quarter	6,766	1,855	4,911	3,505	616	1,939	949	1,406
1979	28,280	7,603	20,677	14,677	2,552	7,489	4,637	6,000
First Quarter	5,080	1,079	4,001	3,029	476	2,004	549	972
Second Quarter	7,926	2,162	5,763	4,071	955	1,458	1,658	1,692
Third Quarter	8,508	2,507	6,001	4,072	505	2,088	1,480	1,929
Fourth Quarter	6,766	1,855	4,911	3,505	616	1,939	949	1,406
1980	31,481	7,532	23,948	17,244	3,444	8,604	5,196	6,705
First Quarter	6,261	1,268	4,993	3,740	485	2,010	1,245	1,253
Second Quarter	8,201	2,057	6,145	4,518	567	2,068	1,883	1,627
Third Quarter	8,962	2,386	6,576	4,563	1,306	2,001	1,256	2,013
Fourth Quarter	8,057	1,821	6,235	4,423	1,086	2,525	812	1,812
1981	30,201	7,844	22,357	15,970	2,695	8,766	4,510	6,387
First Quarter	5,479	1,347	4,132	3,194	509	2,347	338	939
Second Quarter	8,184	2,157	6,027	4,262	519	2,230	1,513	1,766
Third Quarter	9,372	2,531	6,841	4,523	845	1,958	1,721	2,317
Fourth Quarter	7,165	1,809	5,357	3,991	822	2,231	938	1,365
1982	29,779	8,637	21,142	14,781	2,144	8,037	4,601	6,361
First Quarter	4,809	1,482	3,327	2,515	352	1,437	726	812
Second Quarter	8,530	2,321	6,210	4,555	756	2,188	1,611	1,655
Third Quarter	8,223	2,615	5,608	3,544	572	1,816	1,156	2,064
Fourth Quarter	8,217	2,220	5,997	4,167	463	2,596	1,108	1,830

**Expenditures for Residential Improvements and Repairs by Property Type, Quarterly 1962-1998**  
**Not Seasonally Adjusted in Millions of Dollars**

1 Unit Owner Occupied

	Total Expenditures	Maintenance and Repairs	Total Improvements	Additions and Alterations	Additions	Alterations	Outside Adds/Alts	Major Replacements
1983	32,524	8,650	23,874	16,915	4,277	9,310	3,328	6,959
First Quarter	5,334	1,419	3,915	3,054	268	2,239	546	862
Second Quarter	9,048	2,432	6,615	4,913	2,353	1,926	635	1,702
Third Quarter	11,530	2,873	8,657	5,981	1,196	2,878	1,907	2,676
Fourth Quarter	6,612	1,926	4,686	2,967	460	2,267	240	1,719
1984	43,781	15,092	28,689	22,349	5,150	11,010	6,189	6,341
First Quarter	6,590	2,349	4,241	3,521	953	2,045	523	720
Second Quarter	11,956	4,439	7,517	5,913	915	2,641	2,356	1,604
Third Quarter	13,443	4,632	8,812	6,814	1,762	2,934	2,118	1,998
Fourth Quarter	11,792	3,672	8,120	6,101	1,520	3,390	1,192	2,019
1985	47,742	16,091	31,651	22,357	3,361	12,597	6,399	9,294
First Quarter	8,490	2,473	6,017	4,542	563	3,256	723	1,475
Second Quarter	13,091	4,932	8,160	5,821	1,025	2,668	2,128	2,338
Third Quarter	13,475	4,668	8,807	6,415	979	3,211	2,225	2,392
Fourth Quarter	12,686	4,018	8,668	5,579	794	3,462	1,322	3,089
1986	54,298	16,514	37,784	29,261	5,972	15,119	8,170	8,523
First Quarter	9,231	3,229	6,002	4,696	889	3,116	692	1,306
Second Quarter	15,164	4,458	10,706	8,654	1,927	3,970	2,757	2,052
Third Quarter	16,406	4,768	11,638	8,486	1,857	3,118	3,512	3,152
Fourth Quarter	13,498	4,060	9,438	7,425	1,299	4,916	1,210	2,013
1987	54,791	17,552	37,239	29,883	7,882	14,748	7,253	7,356
First Quarter	10,001	3,662	6,339	5,274	1,087	2,794	1,393	1,065
Second Quarter	15,045	4,271	10,774	8,569	2,379	4,020	2,170	2,205
Third Quarter	17,043	4,656	12,387	9,858	2,859	4,523	2,475	2,529
Fourth Quarter	12,702	4,962	7,740	6,182	1,556	3,410	1,215	1,558
1988	60,822	17,921	42,901	33,614	8,843	16,948	7,822	9,287
First Quarter	9,362	3,386	5,975	4,386	836	2,413	1,138	1,589
Second Quarter	18,683	4,980	13,703	10,898	3,273	4,688	2,937	2,805
Third Quarter	18,058	5,178	12,881	10,147	2,867	5,572	1,708	2,733
Fourth Quarter	14,719	4,377	10,342	8,182	1,868	4,276	2,039	2,160
1989	59,858	18,234	41,625	31,648	6,318	16,850	8,480	9,977
First Quarter	11,140	3,576	7,564	5,922	1,335	3,551	1,036	1,642
Second Quarter	16,015	3,948	12,068	9,045	1,376	5,100	2,569	3,023
Third Quarter	18,569	5,650	12,920	9,750	2,095	4,828	2,827	3,169
Fourth Quarter	14,134	5,060	9,074	6,931	1,512	3,371	2,048	2,143
1990	59,683	21,031	38,652	28,491	7,188	16,012	5,292	10,160
First Quarter	12,507	4,390	8,117	6,272	1,877	3,782	613	1,844
Second Quarter	15,844	5,670	10,174	7,485	1,651	4,113	1,721	2,690
Third Quarter	17,213	5,730	11,483	8,293	2,359	4,112	1,823	3,189
Fourth Quarter	14,119	5,241	8,878	6,441	1,301	4,005	1,135	2,437
1991	58,083	23,645	34,438	25,303	6,666	12,726	5,911	9,134
First Quarter	9,572	4,528	5,044	3,619	473	2,401	745	1,424
Second Quarter	17,315	6,538	10,776	9,024	2,619	4,398	2,007	1,752
Third Quarter	18,007	7,272	10,736	7,507	2,543	2,776	2,188	3,229
Fourth Quarter	13,189	5,307	7,882	5,153	1,031	3,151	971	2,729
1992	67,316	23,802	43,514	33,783	6,220	18,866	8,696	9,731
First Quarter	12,018	4,372	7,646	6,287	1,492	4,047	748	1,359
Second Quarter	21,084	7,475	13,610	10,304	1,619	5,245	3,440	3,306
Third Quarter	17,718	7,220	10,498	8,011	1,829	3,693	2,490	2,487
Fourth Quarter	16,496	4,735	11,760	9,181	1,281	5,881	2,019	2,580

**Expenditures for Residential Improvements and Repairs by Property Type, Quarterly 1962-1998**  
**Not Seasonally Adjusted in Millions of Dollars**

1 Unit Owner Occupied

	Total Expenditures	Maintenance and Repairs	Total Improvements	Additions and Alterations	Additions	Alterations	Outside Adds/Alts	Major Replacements
1993	70,746	21,175	49,571	35,798	11,501	17,828	6,469	13,773
First Quarter	11,912	3,287	8,625	6,298	1,191	4,308	799	2,327
Second Quarter	18,803	5,595	13,208	9,298	3,029	3,966	2,303	3,910
Third Quarter	21,555	6,664	14,892	11,126	3,789	4,944	2,393	3,765
Fourth Quarter	18,476	5,629	12,847	9,076	3,492	4,610	974	3,771
1994	77,270	24,241	53,030	37,946	8,360	21,527	8,059	15,084
First Quarter	13,693	4,138	9,555	7,778	2,321	4,086	1,371	1,777
Second Quarter	21,212	6,240	14,973	11,237	2,648	5,816	2,772	3,736
Third Quarter	21,690	7,109	14,582	10,118	2,206	5,462	2,450	4,464
Fourth Quarter	20,675	6,755	13,920	8,814	1,184	6,164	1,466	5,106
1995	75,362	25,076	50,286	32,538	6,507	17,934	8,097	17,748
First Quarter	14,110	4,524	9,585	6,684	517	5,062	1,105	2,901
Second Quarter	23,046	7,580	15,466	10,313	2,869	5,311	2,132	5,154
Third Quarter	20,393	6,499	13,894	8,446	2,291	3,317	2,837	5,448
Fourth Quarter	17,814	6,474	11,340	7,095	829	4,243	2,023	4,245
1996	76,094	20,192	55,903	38,847	10,235	20,471	8,141	17,056
First Quarter	13,814	3,220	10,594	7,269	1,741	4,594	935	3,324
Second Quarter	20,535	5,917	14,619	10,634	2,706	6,139	1,788	3,985
Third Quarter	23,734	5,936	17,798	11,540	3,142	5,490	2,908	6,259
Fourth Quarter	18,011	5,119	12,892	9,404	2,645	4,248	2,511	3,488
1997	82,216	25,537	56,679	39,467	8,365	22,806	8,296	17,212
First Quarter	14,273	3,548	10,725	7,725	1,375	5,375	975	3,000
Second Quarter	22,719	7,079	15,641	11,262	2,603	4,905	3,754	4,379
Third Quarter	26,272	9,199	17,073	11,045	2,643	6,172	2,230	6,028
Fourth Quarter	18,952	5,711	13,241	9,435	1,743	6,355	1,337	3,806
1998	87,243	25,094	62,149	41,342	8,784	23,602	8,956	20,807
First Quarter	15,323	4,316	11,007	8,173	1,620	4,903	1,650	2,834
Second Quarter	25,938	7,135	18,803	13,299	3,252	7,556	2,491	5,503
Third Quarter	24,722	7,873	16,849	10,344	1,612	5,338	3,395	6,505
Fourth Quarter	21,260	5,770	15,490	9,525	2,300	5,805	1,420	5,955

**Expenditures for Residential Improvements and Repairs by Property Type, Quarterly 1962-1998**  
**Not Seasonally Adjusted in Millions of Dollars**

**Rental, Vacant and Seasonal Properties**

	Total Expenditures	Maintenance and Repairs	Total Improvements	Additions and Alterations	Additions	Alterations	Outside Adds/Alts Replacements	Major
1962	3,919	2,011	1,908	1,421	221	891	309	487
First Quarter	778	495	283	168	31	108	29	115
Second Quarter	1,180	497	683	555	46	378	131	128
Third Quarter	953	517	436	288	60	127	101	148
Fourth Quarter	1,008	502	506	410	84	278	48	96
1963	3,555	2,135	1,420	1,000	264	539	197	420
First Quarter	840	511	329	248	51	143	54	81
Second Quarter	759	481	278	176	27	114	35	102
Third Quarter	1,039	600	439	319	88	154	77	120
Fourth Quarter	917	543	374	257	98	128	31	117
1965	3,692	2,273	1,419	841	250	438	153	578
First Quarter	976	618	358	194	56	92	46	164
Second Quarter	851	545	306	167	35	98	34	139
Third Quarter	1,006	608	398	262	38	182	42	136
Fourth Quarter	859	502	357	218	121	66	31	139
1966	3,757	2,425	1,332	757	210	397	150	576
First Quarter	691	503	188	104	18	60	26	84
Second Quarter	804	573	231	121	56	32	33	110
Third Quarter	1,223	693	529	307	42	215	49	222
Fourth Quarter	1,040	656	384	225	95	90	41	159
1967	3,733	2,221	1,512	902	226	546	131	610
First Quarter	816	480	336	226	60	130	35	110
Second Quarter	1,026	574	453	294	50	210	34	158
Third Quarter	989	611	378	200	64	94	41	178
Fourth Quarter	902	557	345	182	51	111	20	163
1968	3,737	2,494	1,243	696	168	402	126	547
First Quarter	777	493	284	170	(NA)	(NA)	(NA)	114
Second Quarter	942	661	281	177	(NA)	(NA)	(NA)	104
Third Quarter	1,075	719	356	173	(NA)	(NA)	(NA)	183
Fourth Quarter	944	621	322	176	(NA)	(NA)	(NA)	146
1969	4,104	2,621	1,483	814	152	457	204	669
First Quarter	673	482	191	88	17	62	9	103
Second Quarter	840	588	253	156	42	88	27	96
Third Quarter	1,423	845	578	310	58	119	132	269
Fourth Quarter	1,167	706	461	260	35	189	37	201
1970	4,322	2,746	1,576	937	149	604	185	639
First Quarter	904	601	302	174	(NA)	(NA)	(NA)	128
Second Quarter	1,115	692	422	284	(NA)	(NA)	(NA)	138
Third Quarter	1,233	790	443	256	(NA)	(NA)	(NA)	187
Fourth Quarter	1,070	661	409	224	(NA)	(NA)	(NA)	185
1971	5,098	3,187	1,911	1,027	319	529	179	884
First Quarter	883	568	315	153	(NA)	(NA)	(NA)	162
Second Quarter	1,185	778	407	222	(NA)	(NA)	(NA)	184
Third Quarter	1,687	1,050	637	350	(NA)	(NA)	(NA)	287
Fourth Quarter	1,344	792	552	301	(NA)	(NA)	(NA)	251
1972	5,397	3,150	2,246	1,273	175	896	202	974
First Quarter	894	589	305	137	(NA)	(NA)	(NA)	168
Second Quarter	1,350	789	561	400	(NA)	(NA)	(NA)	161
Third Quarter	1,757	952	805	493	(NA)	(NA)	(NA)	312
Fourth Quarter	1,395	820	575	241	(NA)	(NA)	(NA)	334

**Expenditures for Residential Improvements and Repairs by Property Type, Quarterly 1962-1998**  
**Not Seasonally Adjusted in Millions of Dollars**

**Rental, Vacant and Seasonal Properties**

	Total Expenditures	Maintenance and Repairs	Total Improvements	Additions and Alterations	Additions	Alterations	Outside Adds/Alts	Major Replacements
1973	6,436	3,887	2,549	1,499	275	1,000	224	1,050
First Quarter	1,175	609	566	377	129	227	21	189
Second Quarter	1,461	989	471	209	30	132	47	262
Third Quarter	1,980	1,162	818	598	38	471	89	220
Fourth Quarter	1,820	1,126	694	315	79	170	67	379
1974	6,323	3,943	2,378	1,242	197	704	341	1,137
First Quarter	1,412	855	557	178	0	153	26	378
Second Quarter	1,279	895	383	172	20	70	82	211
Third Quarter	1,886	1,028	857	579	112	331	136	278
Fourth Quarter	1,746	1,165	581	312	65	150	97	270
1975	8,525	4,857	3,668	2,099	224	1,585	290	1,570
First Quarter	1,635	1,036	599	367	54	270	43	232
Second Quarter	1,838	1,105	733	479	17	387	75	254
Third Quarter	2,391	1,190	1,200	586	66	459	61	615
Fourth Quarter	2,662	1,525	1,136	667	86	469	112	469
1976	8,803	5,537	3,266	1,690	497	922	271	1,576
First Quarter	2,067	1,147	920	587	118	430	38	333
Second Quarter	2,413	1,631	782	346	55	226	64	436
Third Quarter	2,136	1,463	673	296	99	143	54	377
Fourth Quarter	2,188	1,296	891	462	225	123	114	430
1977	8,330	5,121	3,209	1,753	529	976	249	1,456
First Quarter	1,509	1,144	364	141	1	121	19	223
Second Quarter	2,402	1,265	1,137	859	323	428	108	279
Third Quarter	2,314	1,443	871	376	89	186	101	496
Fourth Quarter	2,106	1,270	836	378	115	241	21	458
1978	11,167	5,929	5,238	3,016	832	1,747	436	2,222
First Quarter	2,406	1,156	1,250	685	100	532	53	566
Second Quarter	3,155	1,333	1,822	1,297	541	719	38	524
Third Quarter	2,972	1,814	1,157	567	68	248	250	591
Fourth Quarter	2,633	1,625	1,009	468	123	248	96	542
1979	12,060	6,694	5,365	2,980	699	1,648	633	2,385
First Quarter	2,309	1,385	924	399	16	357	26	525
Second Quarter	3,497	1,830	1,667	1,172	444	519	209	495
Third Quarter	2,990	1,664	1,326	709	105	349	254	617
Fourth Quarter	3,264	1,815	1,448	701	134	423	143	747
1980	12,222	6,963	5,259	2,856	445	1,787	624	2,403
First Quarter	2,719	1,638	1,080	433	13	271	148	647
Second Quarter	3,179	1,909	1,270	716	206	360	150	554
Third Quarter	3,446	1,693	1,752	1,065	79	750	235	687
Fourth Quarter	2,879	1,723	1,156	642	146	405	90	514
1981	14,115	7,554	6,561	3,402	376	2,617	408	3,159
First Quarter	3,060	1,478	1,582	842	12	778	52	740
Second Quarter	3,906	2,065	1,841	985	142	736	107	856
Third Quarter	3,634	2,230	1,404	620	22	528	71	784
Fourth Quarter	3,515	1,781	1,734	955	201	575	179	779
1982	13,510	7,455	6,054	3,087	412	1,951	724	2,968
First Quarter	2,966	1,697	1,270	565	35	414	115	705
Second Quarter	3,962	2,036	1,926	1,267	112	937	218	659
Third Quarter	2,852	1,752	1,100	466	85	220	161	634
Fourth Quarter	3,730	1,971	1,759	789	179	380	229	970



**Expenditures for Residential Improvements and Repairs by Property Type, Quarterly 1962-1998**  
**Not Seasonally Adjusted in Millions of Dollars**

**Rental, Vacant and Seasonal Properties**

	Total Expenditures	Maintenance and Repairs	Total Improvements	Additions and Alterations	Additions	Alterations	Outside Add's/Alt's Replacements	Major
1983	14,937	8,647	6,290	2,991	462	2,104	425	3,299
First Quarter	3,339	1,912	1,427	815	25	723	67	612
Second Quarter	3,317	1,757	1,560	852	302	408	142	709
Third Quarter	3,900	2,190	1,710	957	103	774	80	753
Fourth Quarter	4,381	2,788	1,593	367	32	198	137	1,225
1984	23,153	12,504	10,649	4,407	688	2,819	901	6,242
First Quarter	4,866	2,262	2,604	1,383	164	1,115	105	1,221
Second Quarter	7,558	3,807	3,751	1,288	453	411	424	2,462
Third Quarter	6,092	3,903	2,190	529	34	310	185	1,661
Fourth Quarter	4,637	2,532	2,104	1,206	37	982	187	898
1985	29,457	17,883	11,574	5,327	564	4,068	695	6,247
First Quarter	6,385	4,346	2,040	517	2	387	128	1,523
Second Quarter	6,053	4,090	1,963	1,138	34	880	224	825
Third Quarter	7,690	4,233	3,457	1,521	175	1,208	138	1,936
Fourth Quarter	9,329	5,214	4,115	2,151	352	1,594	205	1,964
1986	33,551	18,465	15,087	7,390	976	4,725	1,689	7,696
First Quarter	7,582	4,141	3,441	1,588	155	964	470	1,853
Second Quarter	7,214	3,558	3,656	2,166	138	1,746	283	1,491
Third Quarter	11,106	6,217	4,890	2,386	373	1,334	678	2,504
Fourth Quarter	7,649	4,550	3,100	1,251	311	682	258	1,849
1987	35,992	19,856	16,136	7,980	1,369	5,345	1,267	8,155
First Quarter	7,560	3,969	3,591	1,655	181	1,229	244	1,936
Second Quarter	8,007	4,299	3,708	2,359	680	1,399	280	1,349
Third Quarter	9,559	5,342	4,218	1,516	262	946	308	2,702
Fourth Quarter	10,866	6,247	4,619	2,451	245	1,771	434	2,168
1988	35,672	20,967	14,705	7,686	2,069	4,404	1,213	7,019
First Quarter	8,115	5,260	2,855	1,628	37	1,382	209	1,227
Second Quarter	8,620	4,804	3,816	2,051	552	1,063	437	1,765
Third Quarter	11,121	6,527	4,594	2,515	958	1,210	348	2,079
Fourth Quarter	7,816	4,375	3,441	1,492	522	750	220	1,949
1989	38,053	22,803	15,250	7,112	364	5,493	1,255	8,137
First Quarter	7,816	4,427	3,389	1,908	85	1,519	305	1,480
Second Quarter	7,895	5,162	2,733	1,468	6	1,313	149	1,266
Third Quarter	11,588	7,010	4,578	1,724	241	1,117	366	2,854
Fourth Quarter	10,754	6,204	4,550	2,012	32	1,544	435	2,537
1990	43,487	28,454	15,032	7,448	1,364	4,664	1,421	7,584
First Quarter	9,295	5,620	3,674	1,518	2	1,212	304	2,157
Second Quarter	10,394	6,576	3,818	2,574	830	1,318	426	1,244
Third Quarter	11,843	7,883	3,960	1,849	48	1,328	474	2,111
Fourth Quarter	11,955	8,375	3,580	1,507	484	806	217	2,072
1991	35,615	24,733	10,882	4,260	1,083	2,189	988	6,622
First Quarter	8,157	6,151	2,006	677	112	453	113	1,329
Second Quarter	6,548	4,997	1,551	862	0	688	173	690
Third Quarter	9,833	6,060	3,773	1,190	211	744	235	2,583
Fourth Quarter	11,076	7,525	3,551	1,530	759	304	467	2,020
1992	33,875	20,233	13,643	5,359	557	2,947	1,856	8,283
First Quarter	5,980	4,045	1,936	798	160	605	32	1,138
Second Quarter	8,620	5,695	2,925	908	21	438	448	2,017
Third Quarter	9,218	4,503	4,715	2,134	314	815	1,005	2,581
Fourth Quarter	10,057	5,989	4,068	1,520	61	1,089	370	2,548

**Expenditures for Residential Improvements and Repairs by Property Type, Quarterly 1962-1998**  
**Not Seasonally Adjusted in Millions of Dollars**

**Rental, Vacant and Seasonal Properties**

	Total Expenditures	Maintenance and Repairs	Total Improvements	Additions and Alterations	Additions	Alterations	Outside Adds/Alts	Major Replacements
<b>1993</b>	<b>35,423</b>	<b>19,566</b>	<b>15,857</b>	<b>9,248</b>	<b>1,238</b>	<b>6,268</b>	<b>1,742</b>	<b>6,609</b>
First Quarter	7,512	5,410	2,102	1,307	86	1,068	132	795
Second Quarter	9,093	4,352	4,740	2,418	808	1,176	433	2,323
Third Quarter	9,388	4,498	4,890	2,764	177	1,833	754	2,127
Fourth Quarter	9,430	5,306	4,124	2,760	167	2,170	423	1,364
<b>1994</b>	<b>33,293</b>	<b>17,778</b>	<b>15,515</b>	<b>8,135</b>	<b>854</b>	<b>5,676</b>	<b>1,605</b>	<b>7,380</b>
First Quarter	6,929	4,238	2,691	1,758	289	1,277	193	933
Second Quarter	7,646	4,258	3,388	1,640	197	879	565	1,748
Third Quarter	9,489	4,510	4,979	2,611	139	2,023	449	2,368
Fourth Quarter	9,230	4,772	4,458	2,126	230	1,498	398	2,332
<b>1995</b>	<b>33,100</b>	<b>15,785</b>	<b>17,315</b>	<b>10,754</b>	<b>1,361</b>	<b>7,717</b>	<b>1,676</b>	<b>6,562</b>
First Quarter	7,120	3,277	3,844	3,184	532	2,286	366	659
Second Quarter	7,340	3,281	4,059	2,826	319	2,101	407	1,233
Third Quarter	10,457	5,502	4,955	2,284	319	1,733	231	2,671
Fourth Quarter	8,183	3,726	4,457	2,459	191	1,596	673	1,998
<b>1996</b>	<b>34,850</b>	<b>15,310</b>	<b>19,539</b>	<b>13,126</b>	<b>1,760</b>	<b>8,397</b>	<b>2,969</b>	<b>6,413</b>
First Quarter	6,956	3,824	3,132	2,004	155	1,655	194	1,128
Second Quarter	7,725	3,831	3,894	2,800	258	1,920	621	1,094
Third Quarter	8,994	3,180	5,814	3,610	618	1,892	1,101	2,204
Fourth Quarter	11,175	4,475	6,699	4,712	729	2,930	1,053	1,987
<b>1997</b>	<b>33,264</b>	<b>11,949</b>	<b>21,314</b>	<b>14,451</b>	<b>2,204</b>	<b>9,229</b>	<b>3,019</b>	<b>6,863</b>
First Quarter	6,084	2,369	3,715	2,417	36	2,087	293	1,298
Second Quarter	8,944	3,471	5,473	4,263	1,125	2,255	883	1,210
Third Quarter	9,485	2,960	6,525	4,299	411	2,649	1,240	2,225
Fourth Quarter	8,751	3,149	5,601	3,472	631	2,237	603	2,130
<b>1998</b>	<b>30,452</b>	<b>13,328</b>	<b>17,123</b>	<b>11,173</b>	<b>1,287</b>	<b>7,966</b>	<b>1,920</b>	<b>5,950</b>
First Quarter	6,933	2,694	4,238	2,745	169	2,348	228	1,493
Second Quarter	8,897	3,785	5,112	3,790	408	2,803	579	1,322
Third Quarter	7,659	3,492	4,167	2,345	286	1,374	684	1,822
Fourth Quarter	6,962	3,357	3,605	2,293	423	1,441	429	1,312

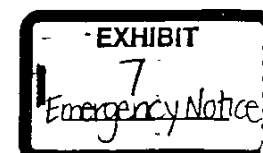
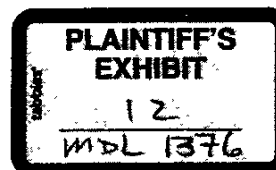
# **EXHIBIT K**

**Table SI. Expenditures to Owner-Occupied Properties by Type of Job: 1993 to 1998**  
 [Millions of dollars. Components may not add to totals because of rounding]

Type of Job <sup>1</sup>	Owner-Occupied						Average relative standard error
	1993	1994	1995	1996	1997	1998	
<b>Total</b>	72,882	81,737	78,583	80,070	85,305	90,209	5
<b>Additions</b>	11,519	8,793	6,576	10,276	8,838	8,805	15
Decks and porches	1,856	1,618	2,419	2,356	2,792	1,658	21
Attached garages	2,290	1,618	1,688	1,312	460	1,690	34
Rooms	7,372	5,556	2,468	6,608	5,587	5,458	22
<b>Alterations</b>	18,514	22,996	19,176	21,667	23,817	24,818	9
Plumbing	877	658	1,050	771	1,547	649	26
HVAC	955	1,591	1,232	1,940	1,902	1,683	29
Electrical	528	796	485	720	542	474	33
Flooring	1,791	2,202	2,000	2,952	2,508	3,213	18
Kitchen remodeling	1,564	1,379	1,716	2,038	3,141	2,593	20
Bathroom remodeling	2,246	3,643	2,501	2,609	3,675	4,749	26
Kitchen and bathroom remodeling	630	1,470	608	845	167	927	43
Finishing space	967	709	1,146	1,196	1,185	1,037	35
Interior restructuring	1,275	2,855	2,249	3,318	3,187	2,993	26
Siding	977	1,245	550	685	1,134	673	55
Windows and doors	848	703	359	538	605	473	29
Other alterations	5,858	5,746	5,280	4,055	4,224	5,356	15
<b>Outside Additions and Alteration</b>	6,516	8,904	8,221	8,387	8,424	9,072	13
Detached buildings	577	1,895	1,271	1,868	2,038	2,335	30
Patios and terraces	520	775	484	983	1,323	668	34
Driveways and walkways	818	468	814	497	1,209	1,313	34
Fences	1,176	1,280	1,447	1,419	1,524	1,585	19
Other outside additions and alterations	3,427	4,486	4,204	3,621	2,329	3,171	20
<b>Major Replacements</b>	14,200	15,869	18,348	18,053	17,600	21,517	8
Plumbing	1,655	1,811	1,997	1,312	1,516	1,128	16
HVAC	3,331	2,815	5,014	3,719	4,487	4,027	16
Siding	1,169	978	1,056	1,849	1,077	1,555	37
Roofing	3,006	4,030	4,176	5,212	5,312	6,443	16
Driveways and walkways	760	875	438	457	537	1,138	32
Windows	1,838	2,487	2,435	3,030	2,739	3,904	23
Doors	958	1,157	1,020	986	982	1,068	19
Other major replacements	1,484	1,716	2,213	1,489	950	2,254	23
<b>Maintenance and Repairs</b>	22,133	25,175	26,262	21,687	26,626	25,998	6
Painting and papering	6,833	6,669	6,660	7,247	7,748	8,641	10
Plumbing	2,002	2,945	2,281	2,285	2,618	2,240	12
HVAC	1,680	1,687	1,692	2,044	1,375	1,845	12
Electrical	483	551	615	418	503	493	22
Siding	584	497	587	241	706	298	57
Roofing	2,707	2,439	2,902	1,670	2,666	2,297	17
Flooring	774	1,490	1,417	1,093	1,638	826	25
Windows and doors	351	855	726	515	853	797	22
Materials to have on hand	1,965	2,270	1,990	2,650	2,726	3,234	16
Other maintenance and repairs	4,752	5,771	7,392	3,523	5,793	5,326	11

NA Not applicable

<sup>1</sup> The expenditures given for each specified type of job consist of those outlays which have been identified as being primarily of the specified type. Thus, expenditures for one type of job done incidental to another type are included under the latter classification. For example, the relatively minor cost of painting done in conjunction with a roofing job is included in the roofing category.



**Table S1. Expenditures to Rental<sup>2</sup> Properties by Type of Job: 1993 to 1998**  
 [Millions of dollars. Components may not add to totals because of rounding]

Type of Job <sup>1</sup>	Rental <sup>2</sup>						Average relative standard error
	1993	1994	1995	1996	1997	1998	
<b>Total</b>	35,423	33,293	33,100	34,850	33,264	30,452	5
<b>Additions</b>	1,238	854	1,361	1,760	2,204	1,287	31
Decks and porches	607	104	264	679	1,143	407	64
Attached garages	222	156	307	79	161	53	80
Rooms	409	594	789	1,002	899	827	30
<b>Alterations</b>	6,268	5,676	7,717	8,397	9,229	7,966	17
Plumbing	329	835	1,304	1,121	1,343	819	22
HVAC	304	469	640	697	1,139	694	38
Electrical	158	274	399	594	686	728	49
Flooring	853	592	937	975	1,153	1,530	29
Kitchen remodeling	#	#	#	#	#	#	(NA)
Bathroom remodeling	#	#	#	#	#	#	(NA)
Kitchen and bathroom remodeling	792	537	1,549	2,037	1,539	1,809	36
Finishing space	\$	\$	\$	\$	\$	\$	(NA)
Interior restructuring	1,595	358	1,143	761	583	193	70
Siding	\$	\$	\$	\$	\$	\$	(NA)
Windows and doors	758	769	518	473	786	397	34
Other alterations	1,477	1,842	1,226	1,738	2,000	1,797	26
<b>Outside Additions and Alteration</b>	1,742	1,605	1,676	2,969	3,019	1,920	23
Detached buildings	276	418	253	1,189	632	546	50
Patios and terraces	\$	\$	\$	\$	\$	\$	(NA)
Driveways and walkways	\$	\$	\$	\$	\$	\$	(NA)
Fences	364	151	140	372	308	176	46
Other outside additions and alterations	1,102	1,036	1,283	1,409	2,079	1,198	30
<b>Major Replacements</b>	6,609	7,380	6,562	6,413	6,863	5,950	16
Plumbing	1,335	1,024	1,056	927	1,249	1,377	19
HVAC	709	1,089	625	1,022	1,430	930	30
Siding	\$	\$	\$	\$	\$	\$	(NA)
Roofing	1,815	2,978	2,104	1,597	1,350	1,691	32
Driveways and walkways	\$	\$	\$	\$	\$	\$	(NA)
Windows	955	910	820	850	1,024	893	48
Doors	216	288	201	173	362	96	36
Other major replacements	1,578	1,089	1,756	1,842	1,447	963	26
<b>Maintenance and Repairs</b>	19,566	17,778	15,785	15,310	11,949	13,328	5
Painting and papering	5,732	4,777	4,250	4,879	3,600	4,010	9
Plumbing	2,111	1,483	1,801	1,468	1,382	1,093	16
HVAC	939	931	948	893	570	584	23
Electrical	446	242	740	456	551	349	30
Siding	613	763	775	458	384	700	45
Roofing	1,415	1,959	1,233	1,485	2,166	1,289	23
Flooring	892	1,050	1,010	860	698	1,657	19
Windows and doors	309	652	651	996	500	531	23
Materials to have on hand	222	556	330	320	282	582	30
Other maintenance and repairs	6,885	5,366	4,047	3,495	1,818	2,534	12

NA Not applicable

# Expenditures included in the "Kitchen and bathroom remodeling" category

\$ Expenditures included in the "Other" category.

<sup>1</sup> The expenditures given for each specified type of job consist of those outlays which have been identified as being primarily of the specified type. Thus, expenditures for one type of job done incidental to another type are included under the latter classification. For example, the relatively minor cost of painting done in conjunction with a roofing job is included in the roofing category.

<sup>2</sup> Includes rental, vacant, and seasonal properties.

**EXHIBIT L**

EXPENDITURES FOR IMPROVEMENTS AND  
REPAIRS OF RESIDENTIAL PROPERTIES  
SECOND QUARTER 1999

Expenditures for improvements and repairs of residential properties in the second quarter 1999 were at a seasonally adjusted annual rate of \$114.1 billion, according to estimates released today by the U.S. Commerce Department's Census Bureau. This estimate is 2( $\pm$ 10) percent above the first quarter estimate of \$111.4 billion.

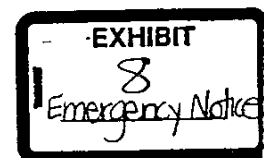
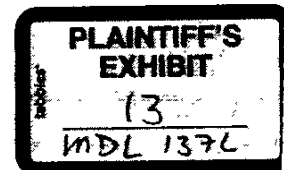
Spending on maintenance and repairs was at a seasonally adjusted annual rate of \$38.2 billion in the second quarter 1999; improvements amounted to \$75.8 billion.

More detailed data will appear in Current Construction Reports, C50/99-Q2, to be issued at a later date. This report will also provide a description of the reliability of the data, survey methodology, and the 90-percent confidence interval.

Questions regarding these data may be directed to Michael Davis or Joe Huesman, Construction Expenditures Branch, Manufacturing and Construction Division, telephone (301) 457-1605.

Table 1. Expenditures for Maintenance and Repairs and  
Improvements  
Seasonally Adjusted Annual Rate in Billions of Dollars  
(Detail may not add to total because of rounding)

Year and Quarter	Total Maintenance Expend- itures	and Repairs	Total Additions and Improve- ments	Major Replace- ments	
1988					
1st quarter	92.0	42.7	49.3	33.7	15.6
2nd quarter	111.8	42.6	69.2	49.4	19.9
3rd quarter	102.1	42.3	59.8	44.1	15.7
4th quarter	95.9	35.9	60.0	43.3	16.7
1989					
1st quarter	96.8	38.2	58.6	42.1	16.5
2nd quarter	97.0	39.1	58.0	38.7	19.3
3rd quarter	104.0	45.5	58.5	39.8	18.7
4th quarter	104.5	46.6	57.9	39.2	18.7
1990					
1st quarter	110.4	48.2	62.2	41.0	21.3
2nd quarter	107.6	52.4	55.3	37.1	18.1
3rd quarter	103.6	50.4	53.2	36.2	17.0
4th quarter	107.1	53.7	53.4	35.9	17.4
1991					
1st quarter	93.7	52.6	41.1	24.7	16.4
2nd quarter	95.5	48.2	47.2	35.5	11.7
3rd quarter	100.3	48.8	51.6	31.6	20.0
4th quarter	97.8	50.3	47.6	30.0	17.6



1992					
1st quarter	95.5	41.0	54.4	38.1	16.4
2nd quarter	115.2	55.1	60.0	40.0	20.0
3rd quarter	97.0	42.9	54.2	36.9	17.3
4th quarter	106.5	41.4	65.1	46.0	19.1
1993					
1st quarter	102.0	42.5	59.6	39.2	20.4
2nd quarter	105.8	40.9	64.9	41.4	23.5
3rd quarter	111.6	41.1	70.5	50.8	19.7
4th quarter	112.7	42.3	70.4	50.8	19.6
1994					
1st quarter	111.1	42.6	68.5	50.5	18.0
2nd quarter	114.3	42.6	71.7	50.8	20.9
3rd quarter	112.7	42.8	70.0	46.8	23.2
4th quarter	119.9	43.5	76.4	47.5	28.9
1995					
1st quarter	115.7	40.9	74.8	50.5	24.4
2nd quarter	114.7	42.7	72.0	46.7	25.3
3rd quarter	110.0	42.8	67.2	41.2	26.0
4th quarter	106.6	41.1	65.4	41.5	23.9
1996					
1st quarter	112.5	38.3	74.1	47.5	26.6
2nd quarter	108.7	37.9	70.8	49.6	21.3
3rd quarter	117.1	34.1	83.0	55.2	27.8
4th quarter	121.4	38.2	83.2	60.9	22.3
1997					
1st quarter	111.5	33.2	78.3	53.4	24.9
2nd quarter	119.7	40.3	79.3	56.2	23.1
3rd quarter	125.7	43.3	82.4	56.3	26.1
4th quarter	114.1	35.3	78.8	55.3	23.5
1998					
1st quarter	121.1	39.2	81.9	56.6	25.4
2nd quarter	130.3	40.6	89.7	61.4	28.3
3rd quarter	113.5	40.5	73.1	46.5	26.6
4th quarter	117.3	37.0	80.3	51.4	28.9
1999					
1st quarter	111.4	34.0	77.4	49.3	28.1
2nd quarter	114.1	38.2	75.8	48.1	27.7

Table 2. Expenditures for Maintenance and Repairs and Improvements  
Not Seasonally Adjusted in Millions of Dollars  
(Detail may not add to total due to rounding)

Year and Quarter	Total Expenditures	Maintenance and Repairs	Total Additions and Improvements	Major Replacements
All Residential Properties				
1998: Total	120,661	39,326	81,335	53,868
1st quarter	22,693	7,175	15,518	11,070
				27,467
				4,448



Page

2nd quarter	35,707	11,116	24,591	17,673	6,918
3rd quarter	33,348	11,580	21,768	12,898	8,870
4th quarter	29,134	9,436	19,698	12,172	7,525
1999:					
1st quarter	20,632	6,195	14,438	9,604	4,833
2nd quarter	31,157	10,472	20,685	13,878	6,807
Relative Standard Error	6	10	7	8	13
All Owner-Occupied Properties					
1998: Total	90,209	25,998	64,211	42,695	21,517
1st quarter	15,760	4,480	11,280	8,324	2,955
2nd quarter	26,809	7,331	19,478	13,882	5,596
3rd quarter	25,689	8,289	17,601	10,553	7,048
4th quarter	22,171	6,079	16,092	9,879	6,213
1999:					
1st quarter	15,585	4,125	11,460	7,705	3,754
2nd quarter	23,142	6,393	16,749	11,450	5,298
Relative Standard Error	7	10	9	10	13
Owner-Occupied One-Unit Properties					
1998: Total	87,243	25,094	62,149	41,342	20,807
1st quarter	15,323	4,316	11,007	8,173	2,834
2nd quarter	25,938	7,135	18,803	13,299	5,503
3rd quarter	25,093	7,950	17,143	10,304	6,840
4th quarter	21,260	5,770	15,490	9,525	5,965
1999:					
1st quarter	15,025	3,926	11,099	7,475	3,624
2nd quarter	21,897	6,016	15,881	11,063	4,818
Relative Standard Error	8	11	9	10	13
Rental Properties(1)					
1998: Total	30,452	13,328	17,123	11,173	5,950
1st quarter	6,933	2,694	4,238	2,745	1,493
2nd quarter	8,897	3,785	5,112	3,790	1,322
3rd quarter	7,659	3,492	4,167	2,345	1,822
4th quarter	6,962	3,357	3,605	2,293	1,312
1999:					
1st quarter	5,047	2,070	2,978	1,899	1,079
2nd quarter	8,015	4,079	3,936	2,427	1,509
Relative Standard Error	14	20	22	25	35

(1) Includes rental, vacant, and seasonal properties.

Note: Quarterly relative standard errors are derived from an average of the most recent 4 quarters.

# **EXHIBIT M**

MONTANA STATE BOARD OF HEALTH

Helena, Montana

DIVISION OF DISEASE CONTROL

REPORT ON AN INDUSTRIAL HYGIENE STUDY

OF THE

ZONOLITE COMPANY

OF

LIBBY, MONTANA

August 8-9, 1956

Conducted by:

Benjamin F. Wake  
Industrial Hygiene Engineer  
Division of Disease Control

Distribution:

This report is confidential  
and is not for distribution  
except to the management of  
the Zonolite Company.

CONFIDENTIAL

PLAINTIFF'S  
EXHIBIT

14  
MDL 1376

EXHIBIT

9

Emergency Notice

PLAINTIFF'S  
EXHIBIT

6-11

On August 8th and 9th, 1956, an industrial hygiene study was made of the Zonolite Company of Libby, Montana, to determine if any of the components of the operation of this company were detrimental to the health of the employees. The study was made after a discussion of industrial hygiene principles with Mr. R. A. Bleich, Division Manager, and Mr. D. Lovick, Assistant Manager. Mr. Walter Baker, Assistant Plant Manager, and Mr. Ted Wright, Repairman, acted as guides for the study.

The present study involved the conduction of an engineering investigation to evaluate the working environment and by making a determination of the environmental factors which might have a bearing on health. Consideration was also given to the ventilation and other protective measures already in use for the control of dust and other toxic materials.

The samples collected were analyzed and counted in accordance with accepted practice generally recommended by the U. S. Public Health Service, the American Conference of Governmental Industrial Hygienists, and other official agencies. Samples collected for dust counts were counted a few hours after they were collected and were analyzed for free silica in the U. S. Public Health Service Laboratory in Cincinnati, Ohio.

#### Description of Operations

The description of the operations of this company have been adequately discussed in previous reports, but, in general, they constitute an open cut mine, a transfer point from the mine to the mill, and various milling and sizing operations done on five floors of the company's mill, a short distance from the mine.

The operation, in general, is that of reducing in size the vermiculite ore which is mined in the open cut mine to various graded sizes which are best for the product which is ultimately an insulation material. In grading and sizing, various vibrating screens are employed to obtain the sizes necessary and to reduce the amount of extraneous material from the ore.

In the mining operations, approximately 17 men are employed per shift and, since the operation is almost wholly outdoor work, no samples for dust concentrations were collected in this area. At the transfer point from the mine to the mill, one man is employed and, although there is some dustiness, it was not felt to be significant and no samples were collected at this point.

In the mill proper, operations are divided into wet mill and dry mill production. In the wet mill, dustiness is quite low; however, in the dry mill the dust from the various sizing and grinding operations is quite high, as noted in the Table I.



The approximate population in the plant at the time of this study was 100 workers, as against 34 workers in 1944, when the last study of the plant was made. The population of the plant a few days before the study was considerably higher but, due to a reduction in the demand for the product, one shift was laid off.

TABLE I  
DUST CONCENTRATIONS IN THE AIR



<u>Sample No.</u>	<u>Location</u>	<u>Description</u>	<u>Concentration in mppcf*</u>	<u>Percent Free Silica</u>
1	Wet mill	General air sample.	11.6	Not determined
2	Dry mill 5th floor	General air Sample	17.9	1.8 (rafter sample)
3	Dry mill 4th floor	General air sample	51.8	Not determined
4	Dry mill 3rd floor	General air sample	28.7	1.0 (rafter sample)
5	Dry mill 2nd floor	General air sample	48.3	Not determined
6	Dry mill 1st floor	General air sample	83.0	1.2 (rafter sample)

Note: Composite air sample all floors provided free silica determination of 1.3%.

Maximum allowable concentrations:

Silica: High - (above 50% free  $\text{SiO}_2$ ) - 5 mppcf  
 Medium - (5 to 50% free  $\text{SiO}_2$ ) - 20 mppcf  
 Low - (below 5% free  $\text{SiO}_2$ ) - 50 mppcf

Dust (nuisance, no free silica - 50 mppcf)

\*millions of particles per cubic foot of air.

#### Concentrations

The concentrations of dust in the air, as determined in table I, vary considerably from a low of 11.6 to a high of 83 mppcf. These concentrations in relation to free silica are not excessive, although the concentrations on the fourth, second and first floor were at or above the maximum allowable concentration even for a nuisance dust with no free silica. On the basis of the asbestos content, no statement can be made, since at this time the asbestos content of the dust has not been determined. However, from visual observation and from information gained at the

plant, a small percentage increase in the asbestos content of the material being processed produces several times greater concentration of dust in the air. The maximum allowable concentration for asbestos is 5 mppcf, and when the concentration of asbestos in the dust samples collected has been determined, further comments on the concentrations will be made. At this time, however, and on the basis of the concentration of asbestos found in the dust, which varies from the company's records from 8 to 21%, it would appear that the maximum concentration of dust in the air should not be greater than 25 to 30 mppcf.

#### Toxicity

A review of the literature indicates that vermiculite or the dust from this material is not especially toxic and is generally included only as a nuisance dust. However, the asbestos dust in the dust in the air is of considerable toxicity, and is a factor in the consideration of reducing dustiness in this plant.

According to Drinker and Hatch<sup>(1)</sup>, the pathologic changes produced by asbestos are not like those of silicosis. The asbestos fiber group about the neck of the small air sacs in the lungs, and stimulate the formation of a diffuse fibrosis. There is no definite migration or transportation of the dust particles to the lymph nodes and no formation of the fibrin nodules. As the fibrosis increases, the reduction in lung area causes a serious decrease in lung capacity, or difficulty in breathing. Lanza<sup>(2)</sup> suggested that enlarged hearts noted frequently in the cases of secondary asbestosis may be the result of the increased work with the heart resulting from this condition. It takes more work to pump the blood through the asbestotic than through the normal lung.

#### Maximum Allowable Concentrations

In the study of an environment from the standpoint of exposure to harmful materials, the use of maximum allowable concentrations is helpful. Maximum allowable concentrations is defined as that concentration of any harmful material in a working atmosphere below which a worker's health will not be affected adversely. Maximum allowable concentrations have been established upon many of the common industrial poisons and they have been based on the results of correlated engineering and medical studies in industries using these materials. Maximum allowable concentrations now in use as a criteria for the protection for the health of the workers are subject to change as additional information is accumulated. The concentrations used in this study are those recommended by the U. S. Public Health Service, the American Conference of Governmental Industrial Hygienists and the American Industrial Hygiene Association. All maximum allowable concentrations recorded are for prolonged exposures or those exposures for an eight-hour working day.

In the evaluation of the worker's exposure to any harmful material, cognizance of the amount of time spent by the worker in the contaminated atmosphere should be taken. For this reason an attempt was made to determine the amount of time a worker spent on all his jobs where they were not continuous. Weighted average exposures more nearly represent a workers actual exposure over an eight-hour day than

- (1) Drinker, P., and Hatch, T.: Industrial Dust, McGraw-Hill Book Co, New York, 1954  
 (2) Lanza, A. J., McConnell, W. J. and Fehnel, J. W.: Effects of the inhalation of asbestos dust on the lungs of asbestos workers, "Public Health Reports", 50:1 of 1935.

does a single sample result representing an exposure for a short portion of an hour a day.

$$\text{Weighted Average} = \frac{\text{concentration of material} \times \text{hours exposed}}{\text{hours worked}}$$

#### Conclusions and Recommendations

From observations made at the time of the study it would appear that the exhaust mechanism for allaying dust generated by the various vibrating machines and other moving parts in the dry mill, in particular, was well designed originally but under the handicap to which this exhaust mechanism is subjected it cannot and does not function properly. The following are several reasons why the dustiness in the dry mill is heavy and why the exhaust mechanism, as designed, does not function:

1. Dust vibrates almost continuously off the rafters which have become loaded and are continually loaded with dust generating from many sources.
2. Rubber connectors between the vibrating screens and the feed spouts are not tight, nor are they replaced when they vibrate off or they are worn out.
3. Rubber connectors between the vibrating screen and the exhaust ducts are either broken, missing, or are not placed on the ducts.
4. Exhaust from some of the vibrators is insufficient to control the dust generated, which, in all probability, is caused by an over-load of the system from other portions of the plant.
5. Belts are off many of the vibrators, making the exhaust mechanism provided ineffective and, in effect, making it wholly inoperative due to the large area from which the exhaust draws.
6. There are many holes in conveyor pipes in such places as stop gates, connections to vibrating screens, and dozens of other points where holes have been cut into the pipes at random locations, or where the pipes have broken by vibration or worn through by friction of the moving ore.
7. Hoods over many of the vibrators are broken, have not been replaced or are ineffective. It would appear that canvas or a resilient type cover over the vibrators would be more effective than rigid type hoods which have been provided.
8. Many of the transfer points from one belt to another are not exhausted and contribute a great deal of dust to the atmosphere.
9. Many of the dead ends in the exhaust system were left open permitting a large volume of air to be drawn in through openings where no control was necessary, thereby reducing the control velocity in volumes of air at more critical points.
10. In many locations it was obvious that the dust collection mechanism was full of dirt or dust and could not be expected to function satisfactorily because of many of the reasons already mentioned.
11. Many of the elevator housings and screw conveyor housings are open in

several places where holes have been cut for various reasons and the housing material removed and not replaced. These elevator housings and screw conveyor housings are particular offenders in production of dust.

12. It was noted during this study that holes were being cut in the exhaust ducts at random without any previous calculation as to the volume of air required, or the reduction of air volume to other locations. The junctions were often left exceedingly rough increasing the frictional resistance in the collection pipe.

13. In some of the locations, particularly on the vibrating screens on the top floor, it is obvious that a great deal of product is being withdrawn through the exhaust system by virtue of too much air being drawn through the system. It is quite probable that the reason for this pick-up of product is because of the imbalance created for the various reasons previously noted.

14. In summary, the foregoing points are illustrative of what would be poor policy in matters of maintenance and operation of this plant. The following recommendations are based on the observations presented and on the basis of the dust counts, silica content, and asbestos content of the dust. It will be recognized that the following recommendations are particularly broad and non-specific; until such a time as the general over-all maintenance and repair of existing dust work, both in the exhaust system and the ore feed pipes have been sufficiently repaired, no specific recommendations appear to be justified. General recommendations are as follows:

1. That all of the unnecessary openings in the entire exhaust system, both in the wet and dry mills be closed properly and a program of discriminatory cutting of pipes be initiated. All access doors, corners, etc., should be provided with tight seals and, of great practical importance, are so designed that they are easily closed and secured by quick-locking devices in place of the usual bolts and nuts. Access doors should be attached by hinges to avoid the frequent damage which occurs when ordinarily manhole plates are removed for inspection and maintenance work. An objective in designing the access should be to make it difficult to keep them open.

2. That all of the unnecessary openings in all of the ore transport ducts and in all the elevator housings and screw conveyors be tightly and completely closed and that all the broken portions of the system of the plant be adequately repaired.

3. That all of the covers on the backs of the vibrators be replaced and made as air tight as possible and that the hoods over the vibrators be repaired and replaced with a type material that will not disintegrate subject to vibration.

4. That all of the exhaust ventilation dust work be examined foot by foot and all holes plugged and unnecessary openings, particularly at dead ends, be adequately closed and the entire system be cleaned of dust which has deposited in any portion of any of the exhaust pipes.

5. That all of the transfer points and points where ore is being deposited into open containers be adequately enclosed and provided with exhaust ventilation.

6. That a system of vacuum cleaning or other cleaning of the rafters in the entire mill be instituted after the other measures have been adequately



accomplished so that the dust load contributed by that dust falling off rafters will be eliminated. Full recognition should be given to the fact that direct control measures alone are usually not enough to insure safe working conditions. The method of operations, proper maintenance of equipment and of housekeeping are equally essential to maintain healthful conditions.

7. That until such time as the repair and maintenance of both the exhaust and ore conveying systems have been complete, all the men in the dry mill be provided with and required to wear an adequate respirator, as indicated in the accompanying list.

8. That the operators of the spray painting equipment be provided with a respirator approved by the Bureau of Mines for such operation as indicated in the enclosed pamphlet.

9. That it be initiated as a policy of the company to be particularly discriminating in the provisions for any holes or outlets to be cut in any exhaust ventilation duct or any ore conveying duct or apparatus and that, if any ventilation must be provided for any process, the quantity of ventilation required be adequately determined before any exhaust capacity is taken from existing lines and that the result of such capacity will be ascertained on all subsequent units when such capacity has been involved.

